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CITY COUNTY STATE

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New York, December 6, 13, 20, 27, 1919

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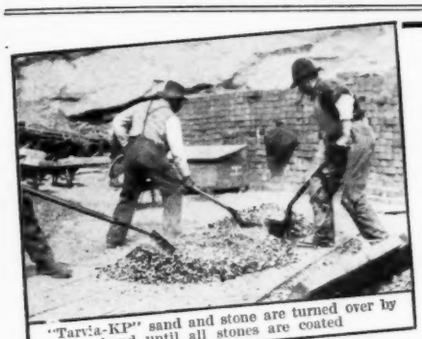
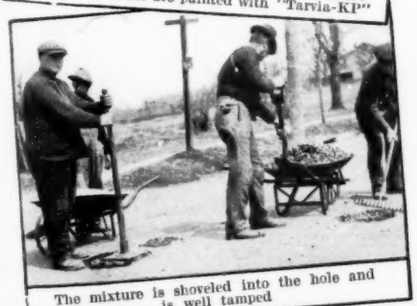


"Tarvia-KP" sand and stone are turned over by hand until all stones are coated

The hole to be patched is cleaned out and the bottom and the sides are painted with "Tarvia-KP"



The mixture is shoveled into the hole and is well tamped

Workingman in foreground is scattering screenings over seal-coat. Then patch is again tamped

Tarvia-KP

FOR COLD PATCHING

—used now will save dollars later!

"TARVIA-KP" is the highway official's "handyman" for quick, dependable patching work on every type of road.

Used now, it will save many dollars of expensive repair work in the Spring. Freezing won't hurt it!

Hundreds of highway officials use Tarvia throughout the winter whenever the roads are free from snow. Thus they fortify their roads against the destruction of winter, and are able to get an early start with their spring surfacing.

The illustrations show how easy it is to use this remarkable *cold* patching material. "Tarvia-KP" is practically fool-proof. Can be stored up in spare moments and used at any time. Order some now.

Interesting booklet showing each step in patching a road with "Tarvia-KP" free upon request. Address nearest office.

The Barrett Company

New York, Philadelphia, Chicago, Boston, St. Louis, Cleveland, Cincinnati, Pittsburgh, Detroit, New Orleans, Birmingham, Kansas City, Minneapolis, Dallas, Nashville, Salt Lake City, Seattle, Peoria, Atlanta, Duluth, Milwaukee, Bangor, Washington, Johnstown, Lebanon, Youngstown, Toledo, Columbus, Richmond, Latrobe, Bethlehem, Elizabeth, Buffalo, Baltimore

THE BARRETT COMPANY, Limited: Montreal, Toronto, Winnipeg, Vancouver, St. John, N. B., Halifax, N. S., Sydney, N. S.

Lincoln Highway through Schererville, Ind., patched with "Tarvia-KP" August, 1916, then surface-treated with "Tarvia-B."

Saving the Minutes on Goodyear Cord Pneumatics

"The Goodyear Cord Pneumatic Truck Tires on our Scott Street Station Fire Truck were purchased in January, 1915. It gives me pleasure to add that this is the most satisfactory equipment with which we have had experience. These pneumatics make it possible to operate our truck more economically and at much greater speed than was possible on the solid tire equipment, which was formerly used on this truck."—E. J. Griffith, Chief, Montgomery (Ala.) Fire Department

Perhaps there is no feature of fire department work that is more necessary than speed. On Goodyear Cord Pneumatics, fire trucks can attain speed with safety.

In Montgomery, Alabama, E. J. Griffith, chief of the fire department, found this to be so; he has known it for almost five years.

For the Scott Street Station fire truck was equipped in January, 1915, with Goodyear Pneumatics, and still they appear almost as good as new.

But this dependable wear is actually of less importance than the greater speed that is now possible to get safely, with this pneumatic-equipped truck.

The big sharp-edged blocks of the Goodyear All-Weather tread resist skidding; they dig in and give traction even in soft and slippery going.

While the cushioning power of the Goodyear Pneumatics protects the truck from injurious jars and jolts, and greater speed can be made, both the truck mechanisms and the men are protected.

Thus through soft going, over slippery streets, even through deep snows, the Goodyear All-Weather Tread Pneumatics enable trucks using them to make more speed surely, and to do it safely.

For further information write the nearest Goodyear Truck Tire Service Station Dealer or The Goodyear Tire & Rubber Company, Akron, Ohio.

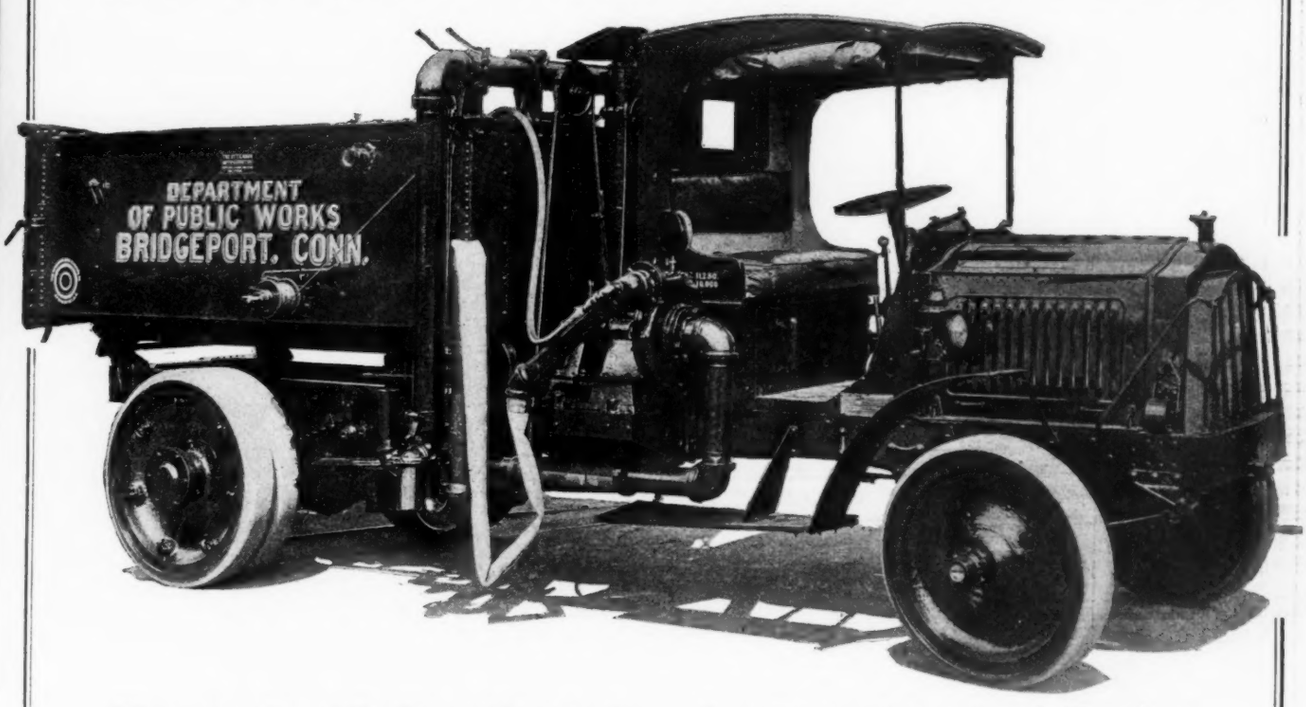
Haul on Pneumatics
SAVE TRUCKS · LOADS · ROADS

GOODYEAR

CLEANING CATCH BASINS

Thousands of Dollars Saved to Cities Yearly in Cleaning Them With The

OTTERSON AUTO-EDUCTOR



Thousands of Dollars Yearly have been saved to the following cities now using the Otterson Auto-Eductors:

Seattle, Wash., 1 machine.
Portland, Oregon, 1 machine.
San Francisco, Cal., 1 machine.
Chicago, Ill., 1 machine.
Chicago, Repeat order for 7 machines.
Milwaukee, Wis., 2 machines.
Milwaukee, Repeat order for 2 machines.
Indianapolis, Ind., 1 machine.
Indianapolis, Repeat order for 1 machine.
Louisville, Ky., 1 machine.
Louisville, Repeat order for 1 machine.
Akron, Ohio, 1 machine.
Albany, N. Y., Repeat order—1 for 1920.
Brooklyn, N. Y., 1 machine.
New Bedford, Mass., 1 machine.
Providence, R. I., Repeat order—1 for 1920.
Richmond, Va., 1 machine.
Bridgeport, Conn., Repeat order—1 for 1920.
Halifax, N. S., 1 machine.
U. S. Army Camps:
Camp Meade, Md.
Camp Gordon, Ga.
Camp Lee, Va.
Honolulu, H. I.

SAVINGS IN BRIDGEPORT, CONN.

Thos. J. Cunningham, Supt. of Street Cleaning, writes: "Under the old system our weekly payroll was $210.00; since your machine has been in use it has reduced cost of operation approximately 50% over cost of hand method, resulting in a saving of more than $100 per week which will warrant this department in asking our Board of Apportionment for an appropriation to purchase another machine."

For further information write direct to

THE OTTERSON AUTO-EDUCTOR COMPANY

817 Fairbanks Building Springfield, Ohio

STATE CAPITOLS
Demand
Quality Pavements

TEXACO SHEET ASPHALT
at the State House, Des Moines, Iowa

TEXACO Stands the Gaff!

TEXACO ASPHALT REG U.S. PAT OFF

THE TEXAS COMPANY
ASPHALT SALES DEPARTMENT
17 Battery Place *New York City*

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Texaco-Asphalt

in the *Blazing* sun

TEXACO Sheet Asphalt on Ancon-Pedro Miguel Highway,
Panama Canal Zone

in the *Freezing* north

TEXACO Sheet Asphalt on Second Avenue
Montreal, Quebec, Canada

Texaco Stands the Gaff!

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THE TEXAS COMPANY

ASPHALT SALES DEPARTMENT

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Des Moines
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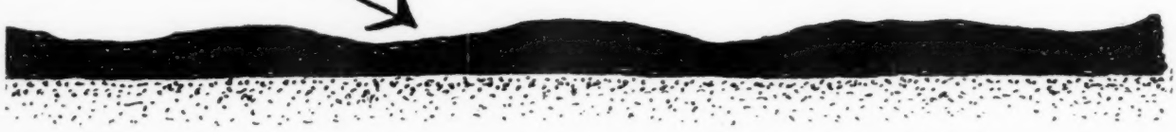
HARD TOP WILLITE HIGH-WAYS

TRADE MARK REG. U.S. PAT. OFFICE

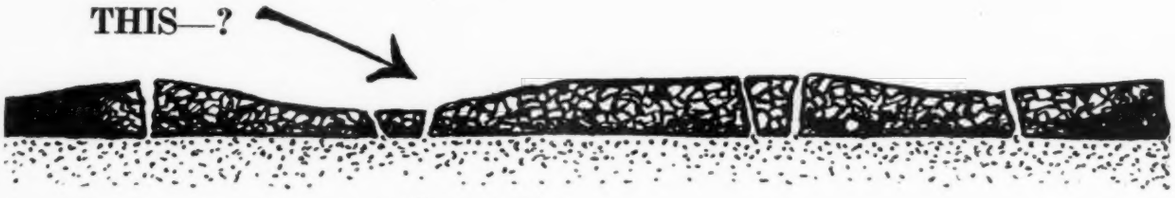
ARMOR PLATE ROADS

WHICH SURFACE WILL BEST SUIT?

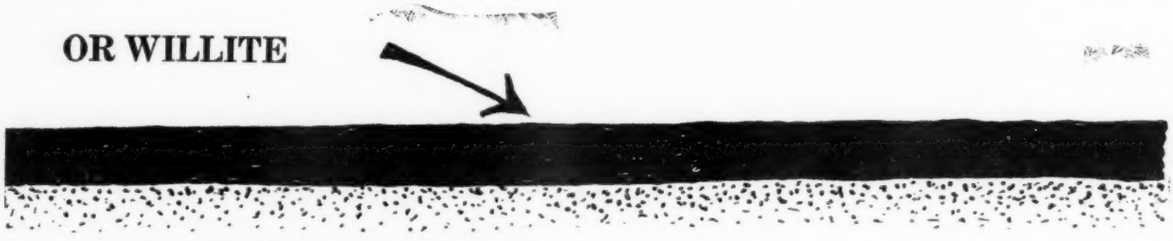
THIS—?



THIS—?



OR WILLITE



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PRIMARILY—
The "Willite" Method Tempers and Toughens a Standard Asphalt Paving Cement—
SO THAT—WILLITE PAVEMENTS

1. Cost Less.
2. Are Waterproof.
3. Are Non-skid.
4. Are Clean—Sanitary.
5. Cannot Disintegrate.
6. Improve with Heavy Traffic.
7. Do Not Rut or Creep.
8. Are Dustless.
9. Minimize Repairs.
10. Do Not Bleed or Soften.

LAID UNDER FIVE-YEAR MAINTENANCE BOND

Willite Road Construction Company of America

51 CHAMBERS STREET, NEW YORK

Contracts anywhere executed by responsible contractors.

Is Car Shortage To Delay Your Program?

ROAD MATERIALS MUST BE SHIPPED FAR IN ADVANCE

Nation's Program of Surfaced Highway Construction Four Times Largest of Any Previous Year

That next year's projected program of surfaced highway construction in the United States is more than four times as large as the largest program in any previous year, and will impose upon the railways of the country a tremendous demand for open-top cars to haul road-building materials, is the information received by the Georgia state highway department from Thomas H. McDonald, chief of the bureau of public roads of the department of agriculture in Washington.

In order to meet this problem, which threatens to retard very heavily the construction of highways throughout the country, the bureau of public roads has issued a call to every state highway department to furnish advance information on construction projects, so that the railways can deliver materials during the early spring of the year when open-top cars are practically idle.

Other means of solving the problem are also suggested, but advance shipments of road-building materials constitutes the basis of the plan formulated by the bureau of public roads, which has had the matter up with the United States railroad administration in a number of conferences.

It is probable that a car service bureau will be maintained by the railways after they go back to private operation in the early future, and this bureau will co-operate with the bureau of public roads in making the fullest possible use of existing facilities.

The bureau of public roads estimates that there will be available next year for highway construction the enormous sum of $863,000,000, which includes federal, state and county funds. The total expenditures for hard-surfaced roads in 1919 was $138,000,000. The largest previous year's total was $136,000,000 in 1916.

Wm. T.

Reprinted from the Atlanta Journal, November 16, 1919.

HARD TOP HIGHWAYS

WILLITE
TRADE MARK REG. U.S. PAT. OFFICE

ARMOR PLATE ROADS

USE LOCAL MATERIAL FOR STREETS AND ROADS
(80–85 Per Cent.)

Almost everywhere, a sand or other mineral aggregate suitable for

WILLITE BASE AND WEARING SURFACE
can be had.

Material required for
10 MILES OF 18-FOOT ROADS
not of local origin.

Willite	100 cars
Asphalt on Concrete	500 to 800 cars
8-inch Portland Cement Concrete	700 cars
Brick on Concrete	850 cars

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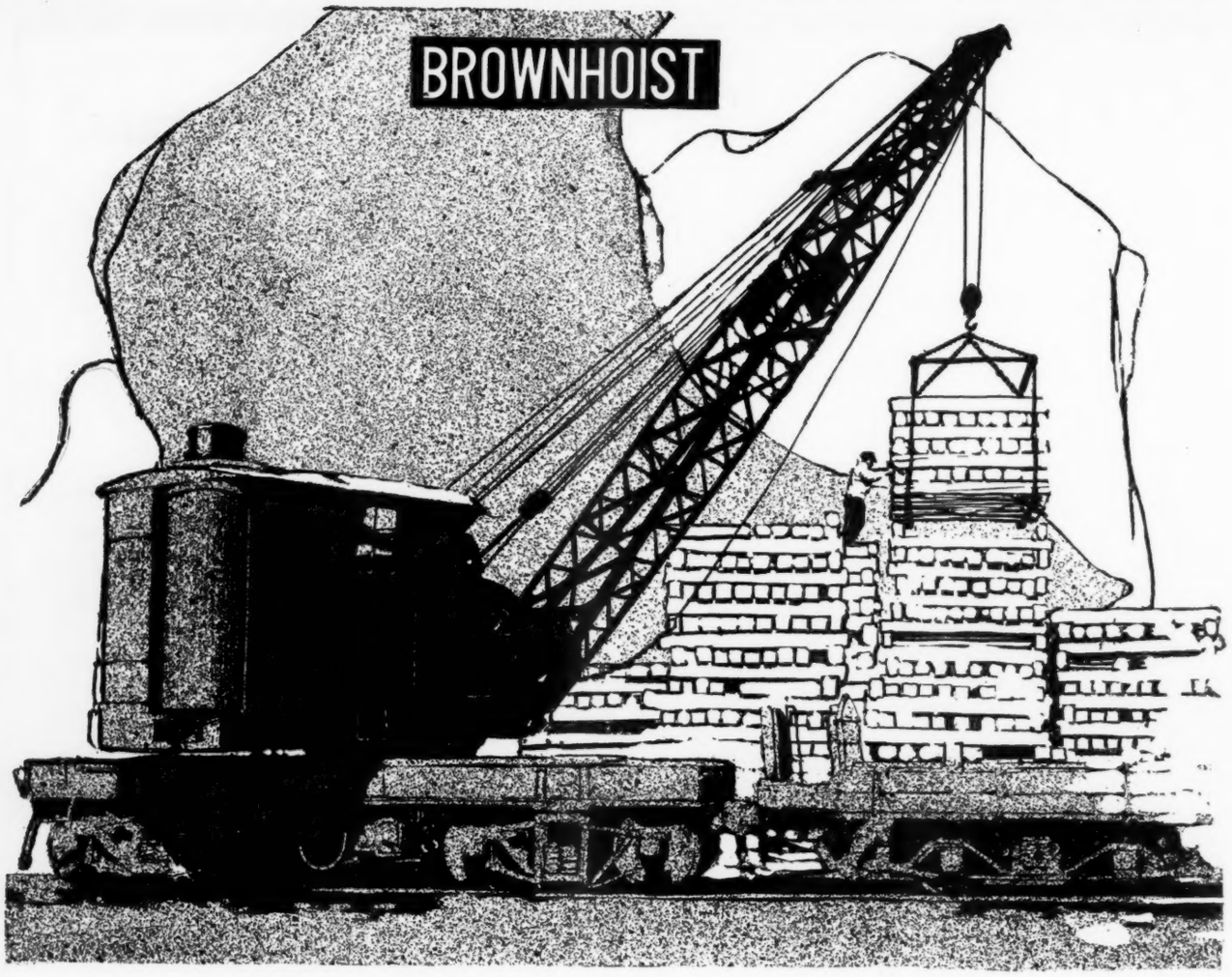
Its Subsidiaries and Authorized Licensees. Specifications and Further Details on Request.



BROWNHOIST

LOCOMOTIVE CRANES

are used in all parts of the world for handling coal, ore, sand, stone, bars, sheets, scrap, lumber and all sorts of sling loads. It is a necessary yard machine for most plants in every line of manufacturing. Write for catalog K which shows how many firms use the Brownhoist Crane.

You can depend upon a Brownhoist

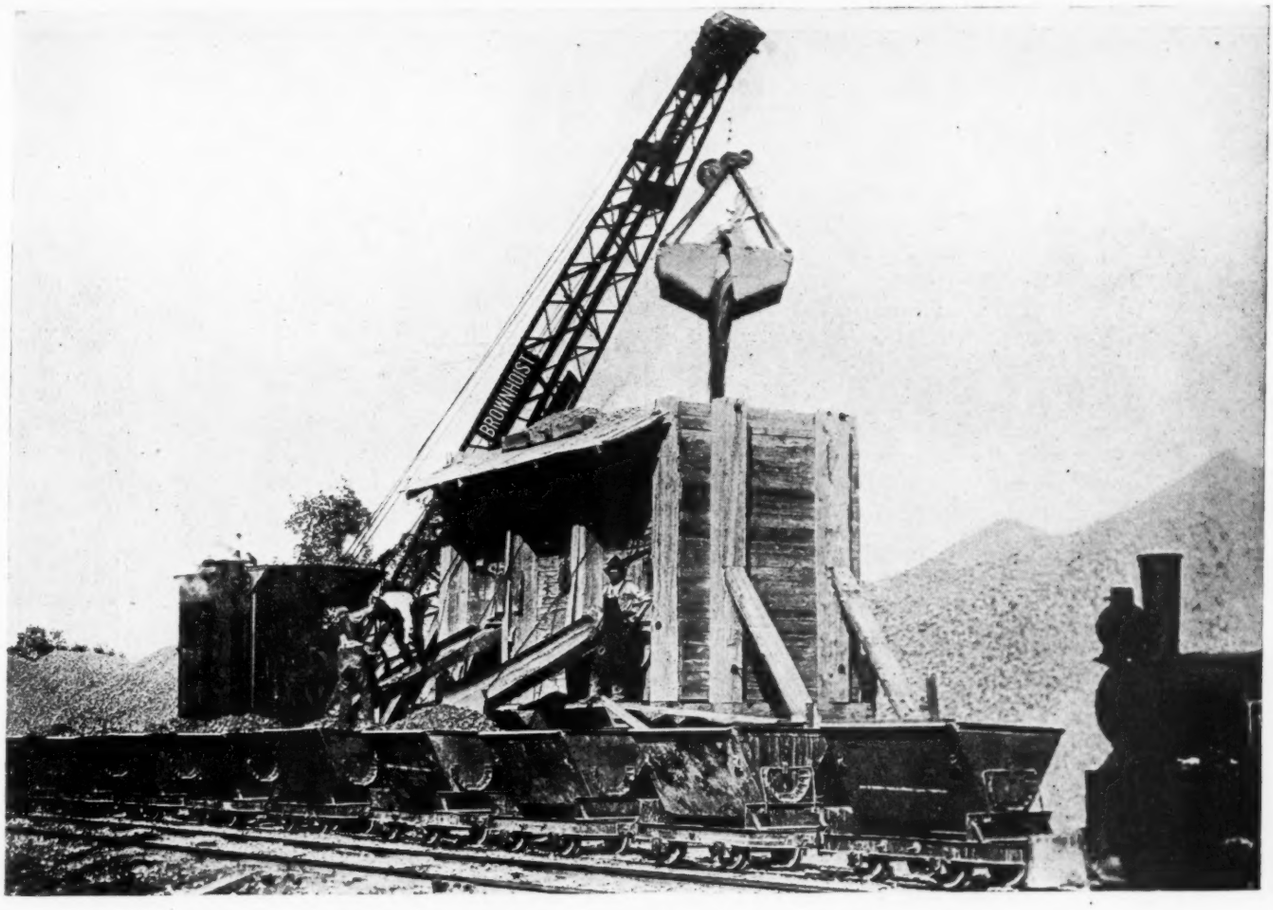
It makes no difference whether your crane-work is 6, 8, 10 or 24 hours a day, you need not worry about the Brownhoist being on the job. It is ready to use whenever you want it, and it keeps steadily at work even if you need it 24 hours day after day. The Brownhoist is the result of 40 years' crane experience. And today it is as well built as an experienced engineering force and a shop of fine mechanics can make it. Just ask any of the users—each will verify this. The Brownhoist may cost more, but it pays in the end, by giving continuous satisfactory service year after year.

The Brown Hoisting Machinery Company

40 Years in Crane Business — **Cleveland, Ohio, U. S. A.**

Engineers and Manufacturers of Heavy Dock Machinery, Bridge Cranes, etc., as well as Smaller Cranes and Hoists

Branch Offices in New York, Pittsburgh, Chicago and San Francisco
European Representative: H. E. Hayes, 12 Rue de Phalsbourg, Paris



BROWNHOIST

Locomotive Cranes and Buckets

are used in all parts of the world. They make an excellent combination for handling bulk materials such as coal, ore, stone, etc. Each is strongly built, as the users will tell you. And they will give continuous service, day and night, if necessary.

Write for Catalog K.

The Contractor's Utility Machine

One of the problems every contractor has to figure out is how best to handle materials. Speed, economy and dependability are the requirements that must be met. Many contractors have found these qualities so well combined in the Brownhoist Locomotive Crane that it has become their general utility machine on every job.

No matter whether called upon to handle bulk materials, such as stone and sand; large structural steel and heavy beams; excavating, or driving piles, the Brownhoist is equally capable and dependable. Construction work is of a kind that is hard on a crane, but that is where the Brownhoist proves its value. It is built for hard, continuous service. If you have handling to do, let us tell you how a Brownhoist will do it. Then you can make a comparison and be your own judge.

The Brown Hoisting Machinery Company

40 Years in Crane Business — **Cleveland, Ohio, U. S. A.**

Engineers and Manufacturers of Heavy Dock Machinery. Bridge Cranes, Etc., as well as Smaller Cranes and Hoists.

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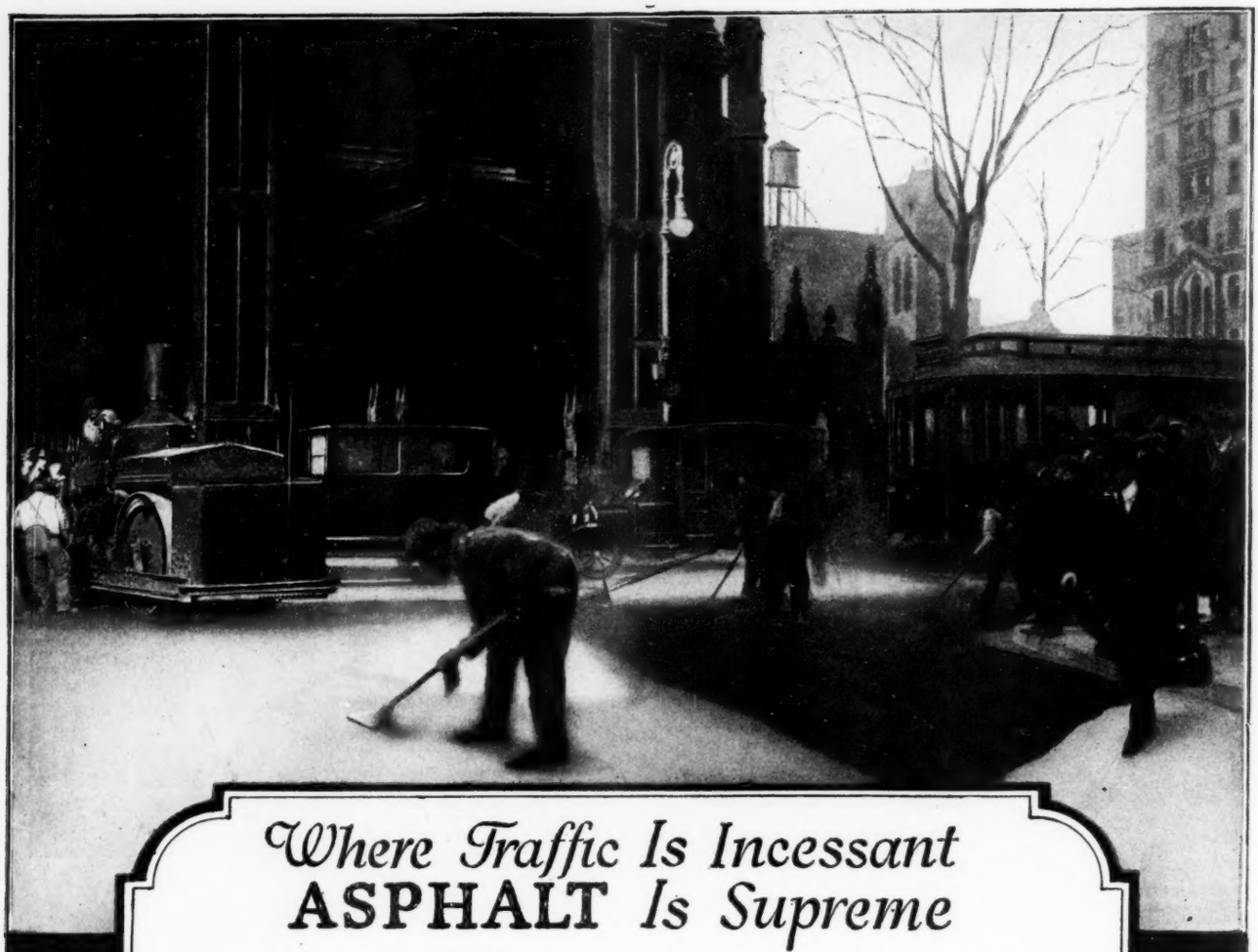

Where Traffic Is Incessant ASPHALT *Is Supreme*

At Broadway and Wall Street, New York, vehicular and pedestrian traffic is continuous. Every type of modern vehicle passes that way, from the speedy roadster to the giant motor tractor hauling twenty ton beams for sky-scraper construction.

Many types of road surface have succumbed to this ceaseless grind. Abandoning experimental and novel pavements, this stretch of Broadway is being rebuilt with time and traffic tested *asphalt*—the modern pavement that resists disintegration from water, frost and heat, that withstands the shock and wear of concentrated traffic for years without deterioration.

The first cost of asphalt roads is not prohibitive for state or county roads. Our engineering department has recently compiled a number of monographs on highway construction, cost and maintenance. They will be sent on request.

Write for Brochures Nos. One to Eight inclusive

THE ASPHALT ASSOCIATION

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TORONTO

15 MAIDEN LANE
NEW YORK

ATLANTA
WORCESTER

ASPHALT

Proved through the Ages

California Approves ASPHALT

The State Highway Commission of California recommends laying an asphalt carpet over all highways of rigid construction as soon after completion as possible.

Their report published last spring states that even a "thin bituminous carpet is of great aid in distributing the impact of heavily loaded vehicles."

The soundness of their conclusion is amply demonstrated by reports from Maryland and many other states where improved roads of many types, unable to withstand the wear of modern road traffic, are being renovated with a compact, cohesive, resiliant asphalt surface.

In terms of service, *asphalt* roads are economical. Their cost is not prohibitive.

Monographs on many phases of highway construction, cost and maintenance, recently completed by our engineering department, will be forwarded on request.

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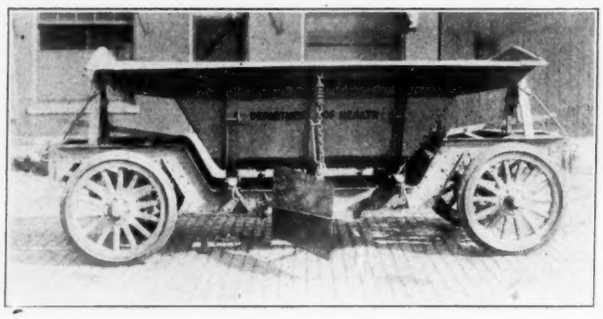
LEE LINE



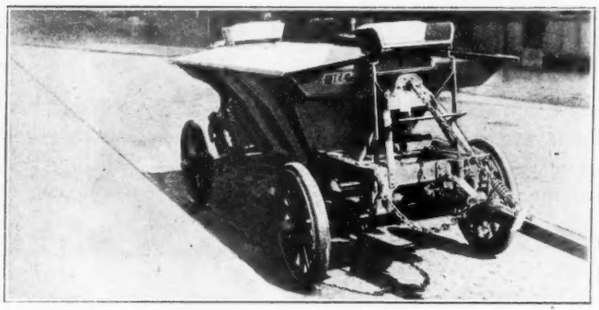
Bridgeport, Conn.

DEPARTMENT OF HEALTH

uses

Lee Drop Frame Trailers

Sixteen of them, with four heavy tractors, increase efficiency and speed of collection, at the same time bringing down costs and reducing the number of complaints by citizens to a minimum.

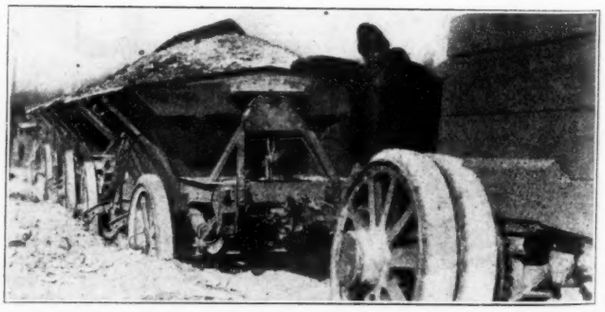


Commissioner of Public Works Courtrade or President W. E. Seeley of the Board of Apportionment will give information of Bridgeport's successful crusade toward perfection in sanitary conditions.

For Garbage and Ash Collection

Lee drop frame trailers with watertight dump bodies are unequalled, as is proved in all cities which have adopted the Lee system.

If it is a Trailer, Semi-Trailer, Motor Truck or Trailer Body or special handling or hauling equipment—we make it.

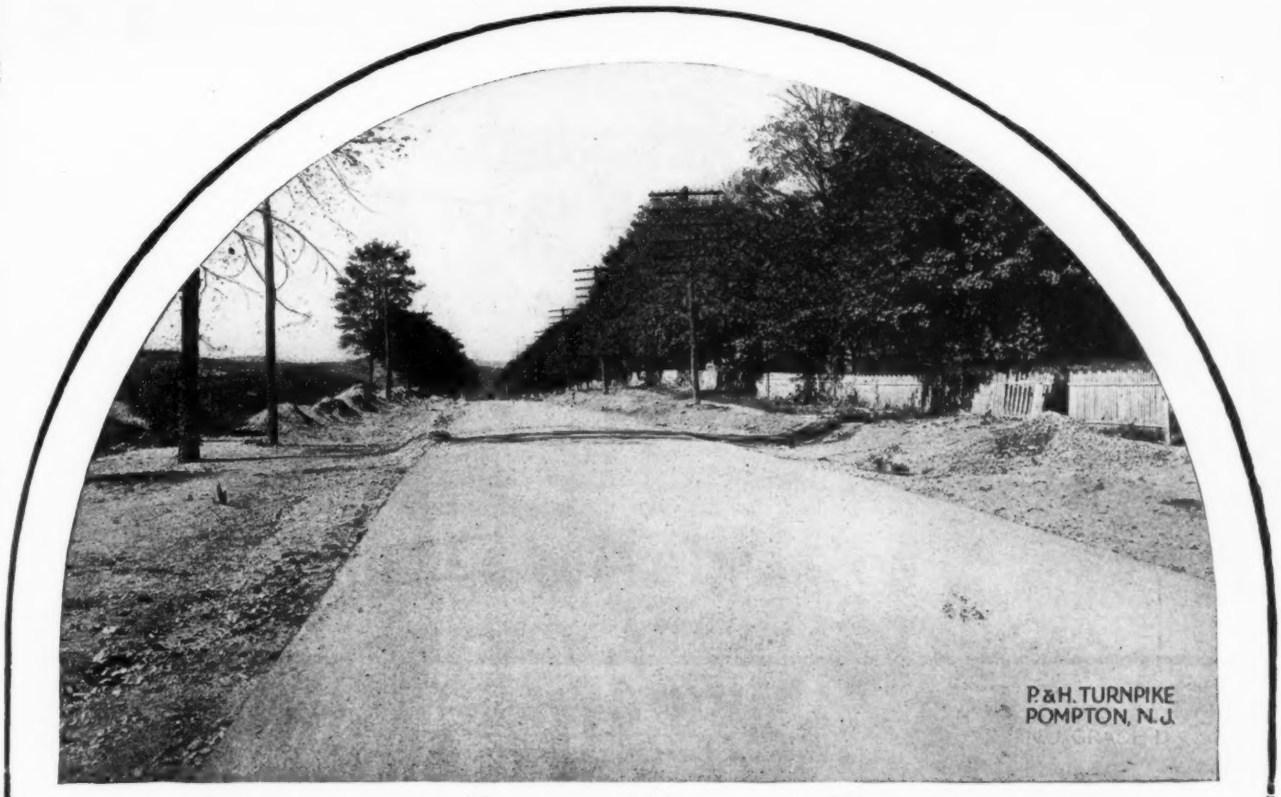


LEE LOADER & BODY CO.

Builders of Automotive Auxiliary Equipment

2330 S. La Salle St. Chicago

LOW LOAD



STANDARD ROAD MAKING PRODUCTS ARE OF THE HIGHEST PURITY

STANDARD Asphalts—Standard Paving and Mixing Asphalts, Standard Binders "B" and "C" for penetration work, and Standard Resurfacing Asphalts—are proven by expert analyses

1. To contain 5% to 33% more bitumen (asphaltum) than the so-called natural asphalts, and to have practically no impurities.
2. Furthermore, they are able to resist climatic changes to a greater extent than other asphalts on the market.
3. They are not affected by water.
4. They have a maximum tensile and cementing strength at both high and low temperatures.

Standard Asphalts are not cut back (fluxed products). They are refined with extreme care, with the idea of producing the best asphalts obtainable.

The greater percentage of bitumen in Standard Asphalts explains why, under average conditions, they cover more yardage per ton than other makes.

Let us supply full information regarding the road-making material which interests you.

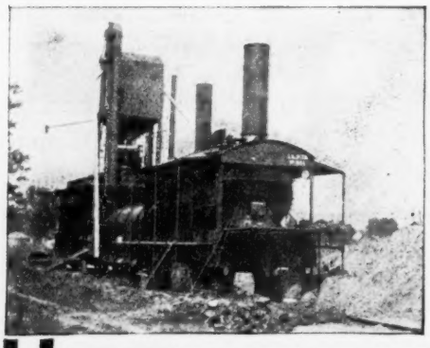
STANDARD OIL COMPANY (NEW JERSEY)

NEWARK BALTIMORE

Geo. W. Lamson, Western Representative, Railway Exchange Building, Chicago, Ill.

STANDARD

PAVING AND ROAD ASPHALT



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PORTABLE &
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THE BEST OUTFITS AND BEST PRICES

WE BUILD THEM OURSELVES

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INDIANAPOLIS, INDIANA, U. S. A.

BITOSLAG

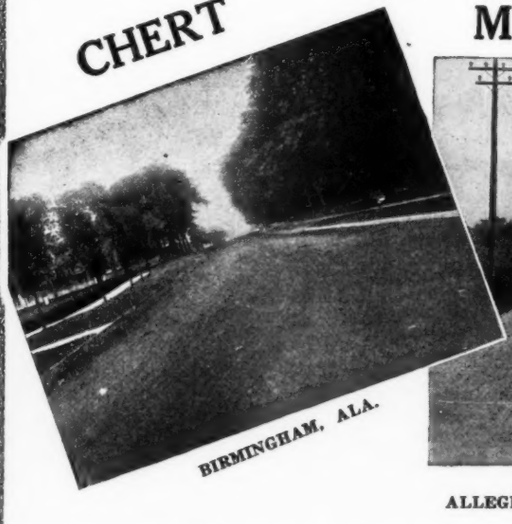
REG. U.S. PAT. OFFICE

"TOPS" THEM ALL

Whatever your old road or street is—chert, macadam, brick or concrete, a BITOSLAG resurfacing will make a new highway of it.

HERE'S WHAT IT DID ON

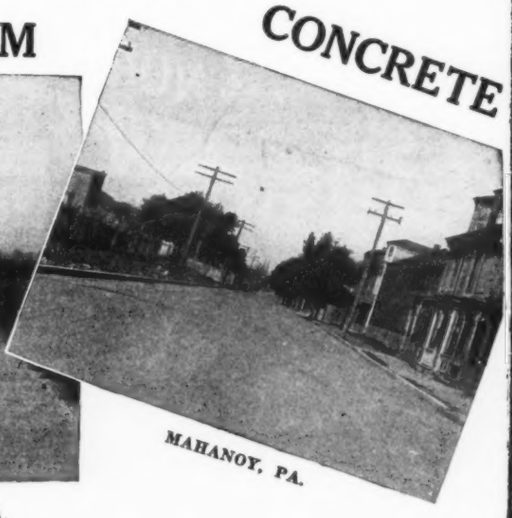
CHERT



BIRMINGHAM, ALA.

MACADAM

CONCRETE



MAHANOY, PA.

ALLEGHENY COUNTY, PA.

You'll find more good examples of perfect resurfacing in Philadelphia, Pa.; Allegheny, Pa.; Coatesville, Pa.; Detroit, Mich.; Luzerne County, Pa. (for Pennsylvania State Highway Department); Fulton County (near Atlanta), Ga., Pittsburgh, Pa. (private driveways); Jefferson County, Ala.

Excellent models of BITOSLAG on concrete base in new construction work are to be seen at South Bend, Ind.; Mahanoy City, Pa., and New Castle County, Del.

BITOSLAG is the peer of all pavements—Why?—because it sustains the heaviest traffic. It is non-skid, pleasing to ride over and non-susceptible to extreme temperature changes.

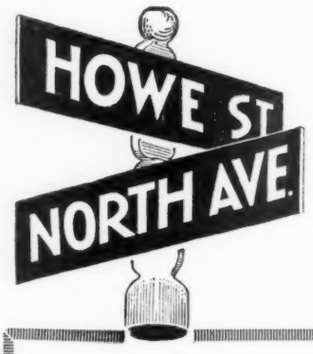
There are thousands of miles of macadam roads in need of resurfacing—Let BITOSLAG go over the top.

Put BITOSLAG in your list of resurfacing jobs this season—you'll want more next!

Write for specifications and full details.

BITOSLAG PAVING COMPANY

90 WEST STREET, NEW YORK



ING-RICH

signs

guide

right

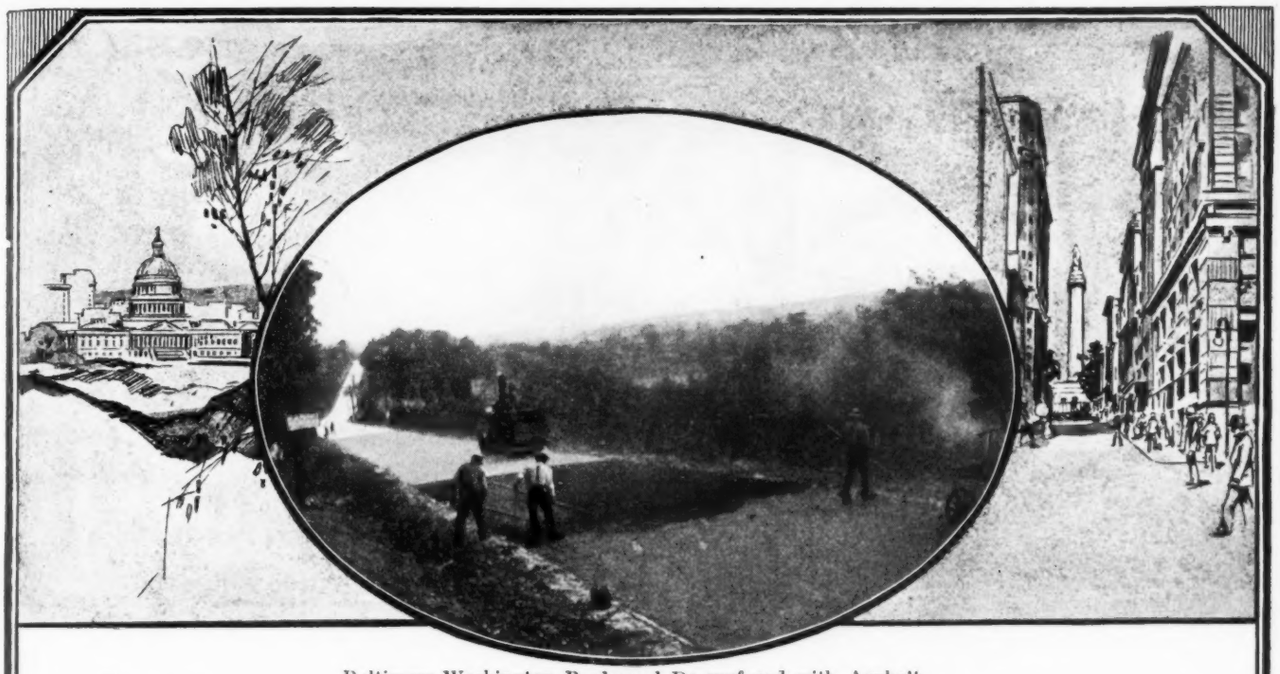
Their color is striking and clear; their design is pleasing. They welcome where old worn signs repel; they guide where old twisted and broken signs confuse.

The difference between ING-RICH signs and ordinary signs is more than paint-deep. In fact, it isn't a matter of paint at all. ING-RICH signs are made by fusing the porcelain enamel into the iron at a heat of 2,000 degrees. That's why neither weather nor wear can hurt ING-RICH signs.

And that's why they are guaranteed for 10 years—they simply can't rust or tarnish or fade. They don't have to be replaced after a few seasons. They save sign money and always give service.

We make all kinds—and any kind—of sign—warning, traffic, numbering or name. Ask us to submit designs for your need. No obligation.

Ingram-Richardson Mfg. Co., Beaver Falls, Pa.



Baltimore-Washington Boulevard Re-surfaced with Asphalt

"We are now covering with a Topping course of Asphalt"

-Says Chief Engineer Mackall of Maryland

Maryland is re-surfacing with *asphalt* portions of the heavily travelled Baltimore—Washington Boulevard, as demonstration has shown that asphalt is the only suitable top course to meet the needs of traffic on this highway.

Traffic-proof and weather-proof asphalt roads can be laid at a cost that is not prohibitive—roads that resist disintegration from water, frost and heat, that withstand the shock and wear of heavy traffic for years without deterioration.

We shall be glad to forward to engineers, contractors and public officials some monographs on various phases of highway economics and engineering recently compiled by our engineering department.

Write for Brochures Nos. One to Eight.

THE ASPHALT ASSOCIATION

Chicago Toronto **15 Maiden Lane, New York** Atlanta Worcester

ASPHALT

Proved through the Ages

Austin Western

Labor Saving is Money Saving

Most of the profit you properly can make on a road contract is derived from what you save in labor by intelligent management. Not only must you use labor saving equipment, but you must see it is thoroughly good equipment.

A first class well balanced line of Road Machinery is the

AUSTIN WESTERN

Manufactured entirely in our own factories and sold under guarantee direct from factory to user, the owner is protected by the oldest established and largest organization of the kind.

Our General Catalog No. 18 describes almost 250 sizes and styles of machines.

Send for it.

The Austin-Western Road Machinery Co.
Chicago

Our Branches	*Our Line*
New York City	Motor Tandem Rollers
Columbus, O.	Motor Macadam Rollers
Albany, N. Y.	Steam Rollers
St. Paul, Minn.	Jaw Rock Crushers
Portland, Ore.	Gyratory Rock Crushers
San Francisco	Stone Elevators
Los Angeles, Cal.	Stone Screens
Boston, Mass.	Stone Bins
Dallas, Tex.	Elevating Graders
Atlanta, Ga.	Quarry Cars
Jackson, Miss.	Blade Graders
Memphis, Tenn.	Road Planers
Charleston, W. Va.	Road Scarifiers
Richmond, Va.	Motor Street Sweepers
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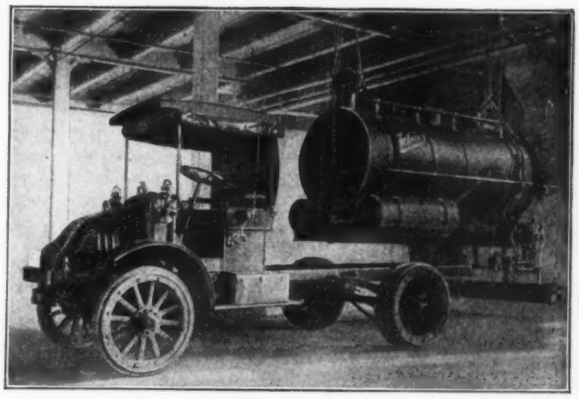
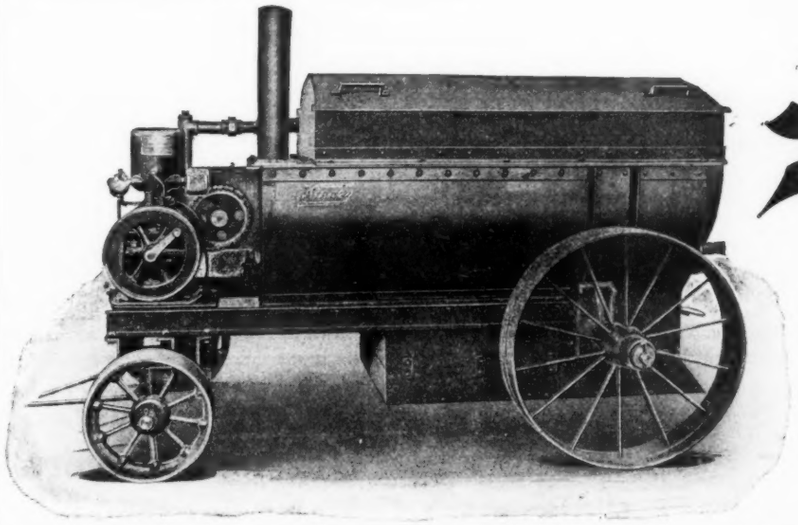


Method of Demounting Oiling Tank and Attachments



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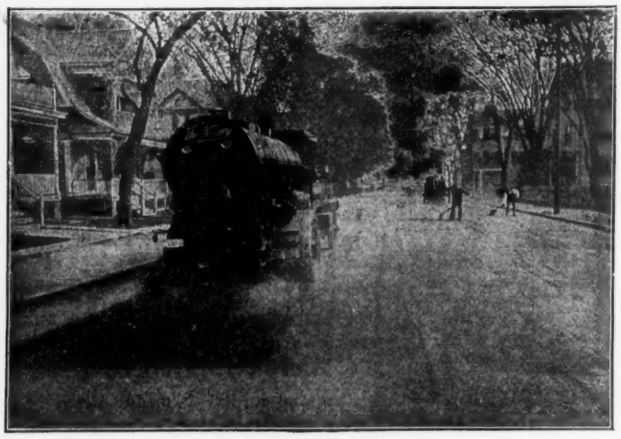

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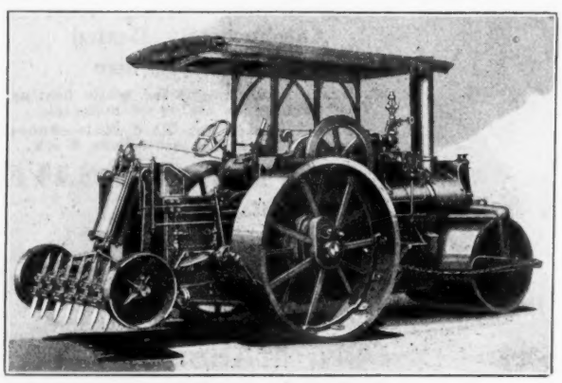

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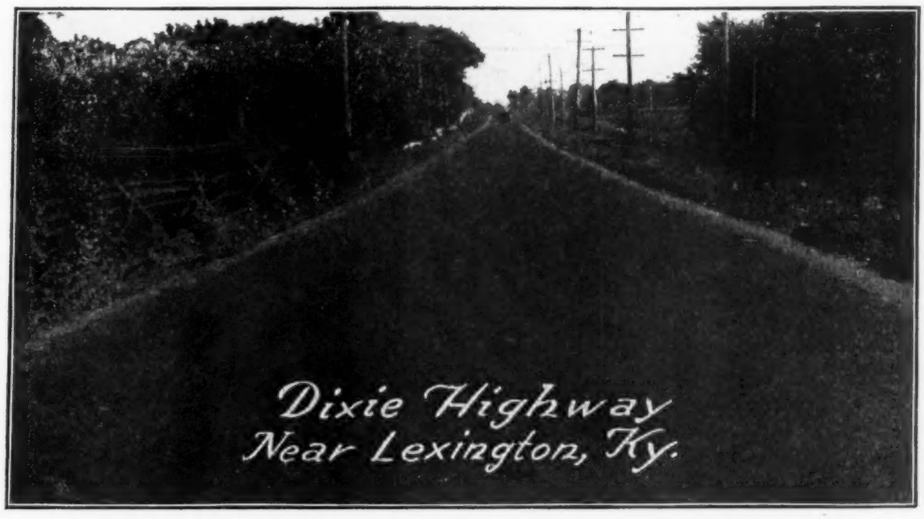

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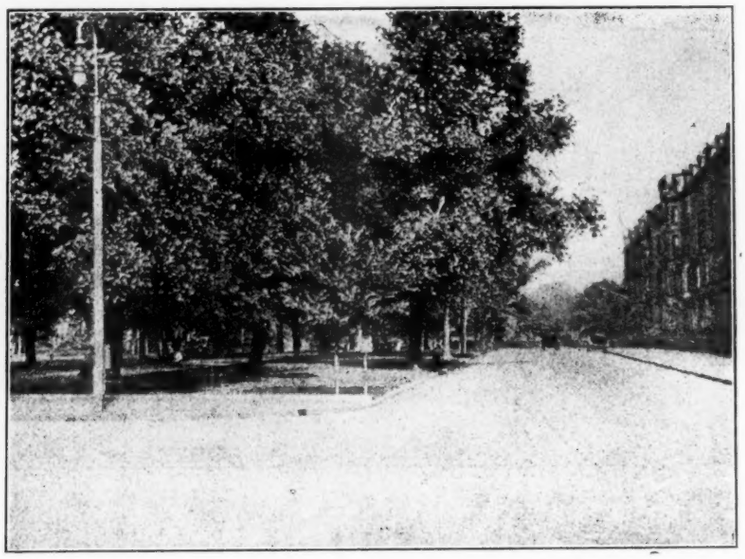

WARRENITE-BITULITHIC PAVEMENT

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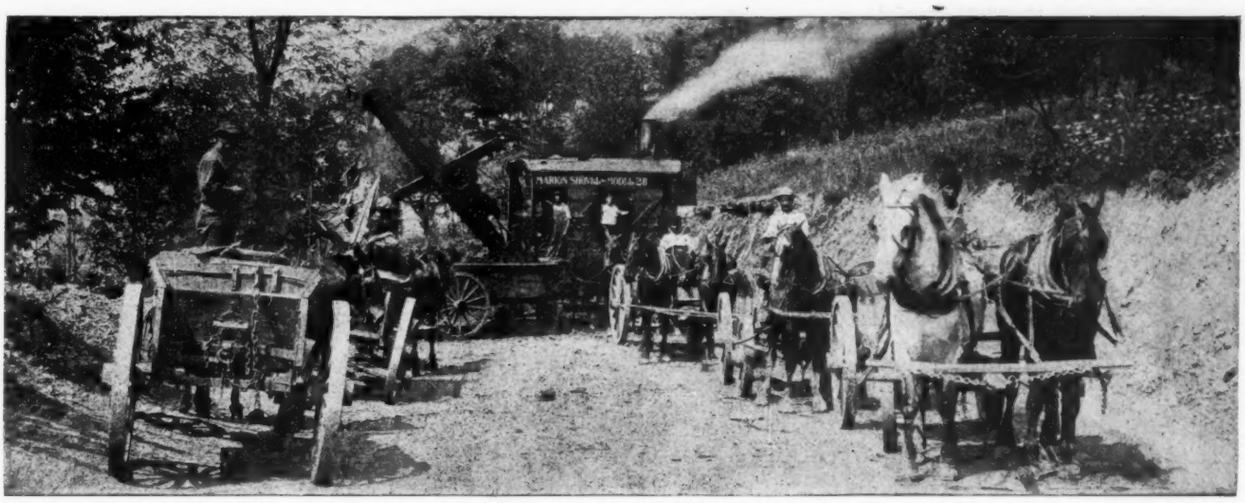

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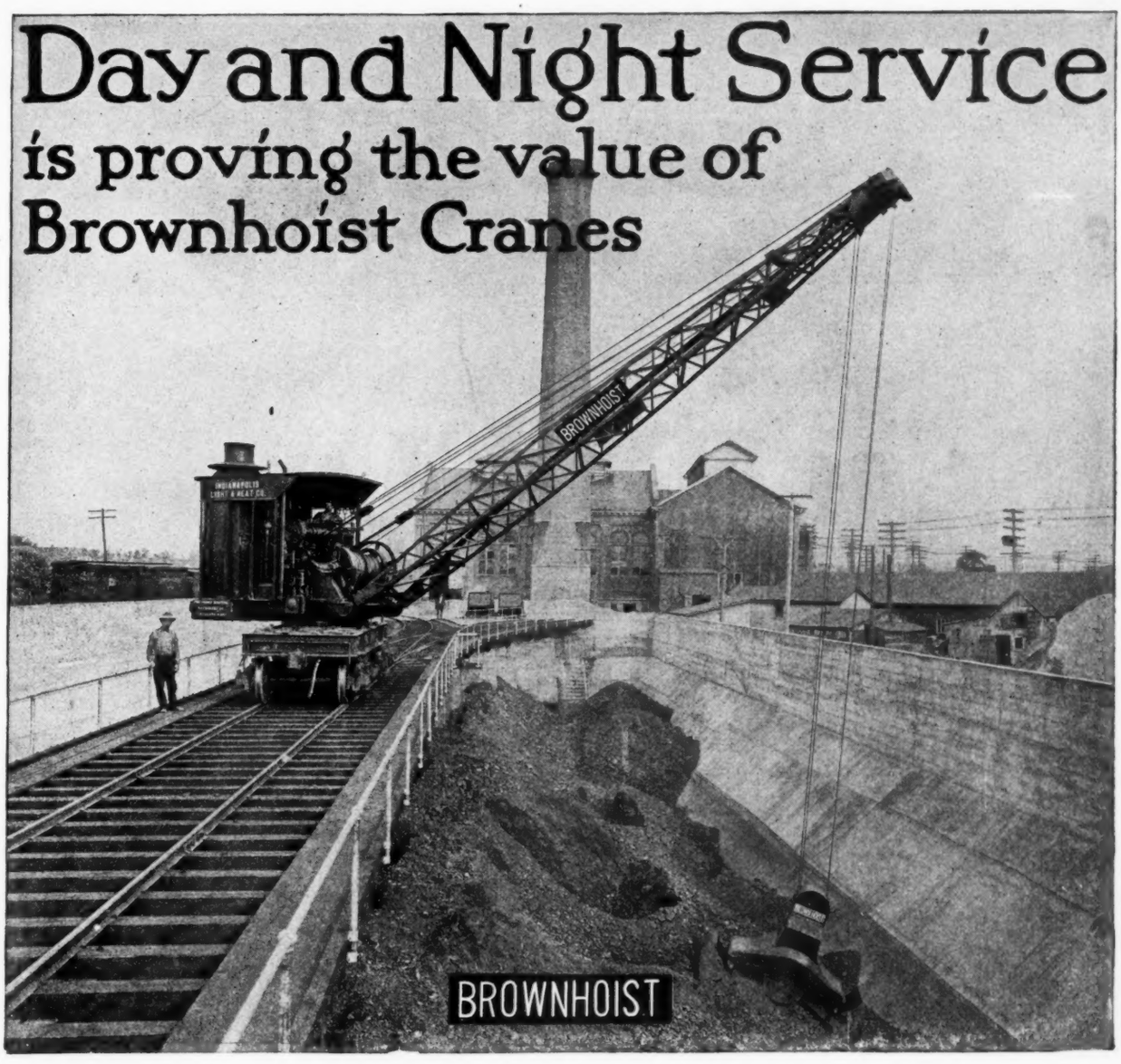

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SIMON BARR, *Assistant Editor*

Contributed Articles and Reports

Contributions suitable for this paper, either in the form of special articles or as letters discussing municipal matters, are invited and paid for.
City officials and civic organizations are particularly requested to send to Municipal Journal and Public Works regularly their annual and special reports.

Information Bureau

The Information Bureau, developed by twenty-one years' research and practical experience in its special field, is at the command of our subscribers at all times and without charge.

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OUR MONTHLY INDEX OF PERIODICALS.

Each month, in the second issue of the month, we publish an index of articles dealing with municipal and public works matters which have appeared in other periodicals. Although we believe that we keep our readers pretty well informed on the most important of such matters, we want to help them to read all that is printed on any subject that they are especially interested in; and many of them find these monthly indexes of great service for this purpose.

Others, however, do not realize how many good things there are in "Municipal Journal & Public Works." If you have overlooked these monthly indexes, let us call your attention to them. The November periodicals are indexed in this issue. You will find them on the right-hand pages alternating with the pages devoted to Contract News immediately before the advertising pages.

MAINTAINING SEWERS WITHOUT FLUSHING.

It has been and is, we believe, the opinion of most sewerage engineers, including the writer, that, in order to prevent deposits and the accompanying odors in dead-end sewers or those forming the furthest extremities of laterals, it is necessary to flush these at intervals, preferably of not more than a day or two. And yet instances have been reported where such dead-ends have operated for years without any flushing and without any objectionable features apparent thereform. One such is referred to in this issue, the borough of Millville having used dead-ends laid on grades of one per cent or more, in connection with which not only were there no regular appliances for flushing, but the houses connected with the sewers had no public water supply for the first four years and therefore probably did not discharge so large an amount of water as would houses in a city furnished with such supply. The system has now been operating for twenty years, and is reported to have never given any trouble.

Possibly considerable importance should be attached, however, to the fact that the upper end of each sewer was connected to the roof-water leader from the nearest building, by which the run-off from the roof served to flush the sewer during each rain storm. It is interesting to note that a similar expedient for flushing sewers was adopted in the construction of the industrial housing project of Loveland Farms near Youngstown, Ohio (to be described next week).

It would seem very probable that this use of roof-water would be much preferable to no flushing whatever; but there remain the objections that the flushings take place only when rains occur and consequently are under no possible control of the municipal authorities, and further

that the fact that some houses are permitted to connect roof-water leaders to the house sewers may lead amiable officials to extend the privilege to others until so many houses are so connected that the capacity of the sewer is far overtaxed in time of rain storms, with disastrous results. In spite of these exceptions, therefore, the writer would much prefer provisions for flushing all dead-ends by which the times and rates of flushing would be under the control of those whose duties it is to maintain the sewers.

AGGREGATE SHORTAGE IN 1920.

The production of sand, gravel and crushed stone must be nearly doubled to carry out the construction program of 1920. This is the statement of the National Association of Sand and Gravel Producers, supported by certain figures and calculations. These, in general, are that in 1916, when there was the largest production of mineral aggregates in this country ever reported—140 million tons —$136,000,000 was spent for surfacing roads, exclusive of municipal paving, for which it is estimated that forty million tons of aggregate were used, leaving one hundred million for all other purposes. There is available for high way work in 1920, $633,000,000, which, at $20,000 a mile, would build 31,650 miles of road, requiring 125 million tons of aggregates. This does not include maintenance of highways or street paving. It is also estimated that the demand for stone for buildings, railroads, etc., will be 50 per cent greater than in 1916, giving 150 million tons. This gives 275 million tons of aggregates needed for next year's work.

The effort of the Bureau of Public Roads to secure action tending to facilitate the production and distribution of aggregates, and actions taken by state highway departments toward the same end, have already been reported in these columns.

CASHING IN ON LEISURE TIME.

Whether a man makes a success or failure of life depends largely on how he spends his leisure hours.

Entering a contractor's office the other day, a representative of this paper found him sitting at a table well covered with copies of "Municipal Journal & Public Works" and other technical papers, most of which were still in their wrappers. He explained that, now that the outdoor work was over for the season, he was catching up in his reading and trying to get some pointers for next year's work.

We suspect that there are a great many of both contractors and engineers, who, although too busy to keep up with the art and science of their business or profession during the construction season, are too lazy or indifferent to do so when winter gives enforced leisure. The next three months, in the northern part of the country at least, will not offer much opportunity for outdoor work, but there is every evidence that it will come earlier in 1920 and with a bigger rush than ever before, in highway construction at least. Consequently, preparation in the way of learning more effective or economical methods, or selecting new equipment, or in any way preparing either knowledge or plant for next season's work, must be done during these next three months. And twelve weeks is a mighty short time to do it in.

The engineer who fails to keep up to the minute in the scientific discoveries and the improvements in the art of his profession, or the contractor who fails to learn of the methods and appliances by which some of his competitors hope to do work cheaper next year than last, is losing a most important opportunity.

These things cannot be found in text books—they are too new. Some can be picked up by conversation and visiting around among fellow engineers and contractors; but the richest mine of information will be found in the technical papers, and the wise contractor or engineer who has been too busy to keep up with his reading during the working season will utilize the opportunity offered by the next few weeks to catch up with the procession of those whose "knowing how" will make them next year's successful ones. For methods and materials he will read the descriptive articles; for new equipment he will study the "New Appliances" department; and he will read the advertisements from cover to cover. And it is dollars to doughnuts that in some of these he will find a solution to problems that have troubled him or that he is going to run up against next season.

WISCONSIN CEMENT CONTRACTS.

The state highway engineer of Wisconsin, A. R. Hirst, is among those who are making early preparation for next season's work, especially in the matter of obtaining materials well in advance of the opening of construction. Bids were called for December 15th for about 470,000 barrels of Portland cement to be delivered next year for use on Wisconsin federal aid projects for road, bridge and culvert construction. The general conditions state that it is the aim of the commission to store as much cement as possible during the first four months of 1920, and they estimate that they will be able to receive about 25 per cent of the total amount before the first of May.

In addition to this early asking for contracts, the specifications contain several provisions worthy of notice. The cement is required for nearly one hundred projects, and the approximate amount required for each is stated, but the contractor "will not be required to furnish more than 10 per cent over the estimate named for each destination."

"In the event of an increase or decrease in transportation charges on cement furnished on this proposal, from point of shipment to place of delivery, the amount of such increase or decrease shall be added to or deducted from the price paid to the bidder, on all cement shipped by it during the period in which such changed transportation charges are in effect."

Bids are asked for cement in cloth sacks, in paper bags, and in bulk, 376 pounds being considered equivalent to one barrel in the last case; the commission having the option of specifying in which of these three ways the cement shall be shippd. The bid is to include 15 cents a sack for cloth sacks, which amount will be returned to the commission in exchange for empty sacks. The price of paper bags will be included in the bids for the cement. "Shipments in paper bags are made at commission's risk of breakage and resultant loss of cement."

The successful bidder must give a bond in a sum not less than 100 per cent of the estimated amount of his contract.

Payments for cement will be made within thirty days from the date of invoice covering each shipment. If they are made three times a month averaging within ten days from date of invoice, a discount of 5 cents per barrel is to be allowed.

The commission agrees to accept or reject proposals within ten days after the bids are opened.

Asphalt Paving in a Small City

By W. A. Hardenburgh

A contractor in North Carolina is using pneumatic tires on his trucks. At a central oil-burning concrete mixing plant he unloads five cars of stone and sand a day directly into bins by means of an unloader; from the bins it falls into measuring boxes, from them into the mixer, and from the mixer into the trucks—all by gravity. Other details also are described.

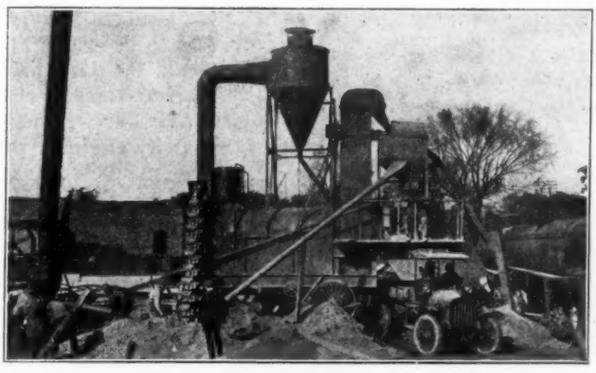
Of interest to every contractor and municipal official are the various devices, plans and machines that may be adopted or used to overcome the high cost and inefficiency, not to mention the scarcity, of labor. Workmen may not really be difficult to get in quantity, but to secure labor in quality is the problem of the contractor's life. Some of the devices being used in the laying of a large amount of sheet asphalt in a small North Carolina city, Fayetteville, may be of interest, for they represent practices in a section of the country which the past few years have enriched materially and which now is attempting to make up for the past lean years of municipal improvements. Indeed, throughout the Southeast generally, money for new construction is plentiful and construction work waits only on the ability to get equipment and labor.

The job in question included principally the laying of about 50,000 square yards of asphalt pavement on a concrete base. There was, in addition, considerable resurfacing work and patching, curbing, etc. The streets that are being paved are mainly old water-bound or penetration macadam, and require only shallow grading, concrete base and asphalt surfacing. The concrete base is of 1:3:6 mixture, and there is one and one-half inches each of binder and wearing courses.

Usual practice is followed in the patching work. Hot asphalt is hauled from the plant by 2-ton motor trucks, as needed. In the resurfacing, the old surface is first swept clean and then spread with a mixture of asphaltic cement and naphtha, the proportions being about half and half. Wearing surface is then applied and rolled.

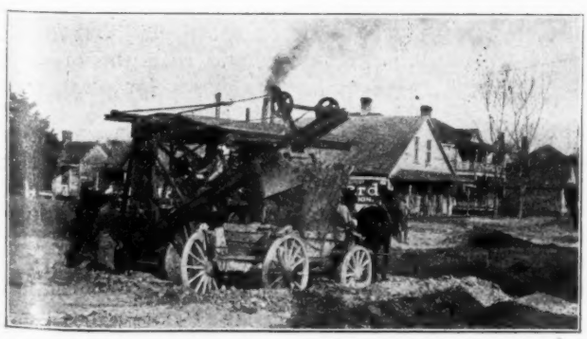
Very few men are required for the excavating and grading work. A No. 6 Keystone grader, equipped with a half-yard scoop, is used to bring the street to rough grade and section. The average excavation is in the neighborhood of 8 inches. The usual amount of excavation per day is from 150 to 180 cubic yards. This is hauled by teams and trucks, and is being used by the city for surfacing other streets. This old macadam material is un-

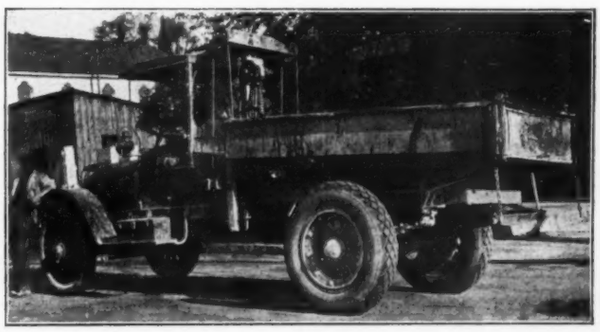
At the right is shown the oil-burning asphalt plant used on this contract, having a capacity of about 800 square yards of pavement a day. It is located near the center of the city.



Below is shown the type of truck used for hauling both asphalt and concrete. The unusual feature of these is the use of pneumatic tires—40x8 rear and 37x5 front. In the light, sandy soil of this section, these tires compact the sub-grade instead of cutting into it. Also the contractor finds the truck wear and breakage less and the speed greater than with solid tires.

Below is the grader used for rough-grading the streets an average depth of about eight inches. It is removing 150 to 180 cubic yards a day.





usually good in quality and is mixed with just enough clay and dirt to compact readily, forming a good and cheap surface.

THE MOTOR TRUCKS.

At present the contractor has but four motor trucks, though six more have been ordered. Of the four now in use, two are engaged in hauling "hot stuff," while the other two are used in connection with grading work.

These trucks are rather peculiar, or rather the contractor has ideas about trucks that differ from those usually held. His trucks are 2-ton "Superior" machines, equipped with hand dumps in preference to power dumps, and with pneumatic tires. The rear tires are 40 x 8 inches and the front 37 x 5 inches. Although both first cost and tire-mileage cost may be greater, the contractor contends that this is more than overcome by the less wear and breakage on the trucks and, to some extent, by the better speed the trucks are able to maintain continuously.

The roads in this section are either sandy or of a light clay that will not withstand heavy wheel loads, and there is no doubt that trucks with pneumatic tires can be handled easily on soft subgrades. Unlike the knife-shaped solid tires in general use, which seem designed to cut into the ground under a load, the pneumatics left scarcely more than the mark of their tread on the subgrade.

The number of teams used to aid the two trucks in hauling away excavated material varies. The length of haul changes almost daily as the point of delivery of the excavated material is shifted from one street to another.

PREPARING SUB-GRADE.

Following the grader are two men with a team and a dump scraper. This outfit cleans up along the street curbs and brings the street as near as possible to the final grade and section. The material excavated by them is piled in large heaps at such intervals along the street that the scraper does not have to exceed the economical haul. These heaps are later removed by steam shovels. As the street to be paved is already curbed and practically graded, all material has to be hauled away.

Following the rough-graders, grade stakes are set and a final grading gang of five men bring the street to the final grade and section. The waste piles formed by the rough grading gang are used for either borrow or storage piles.

MIXING CONCRETE.

No concrete base has yet been laid, but the absence of water at the far end of the street, and the cost and difficulty of piping or bringing it by hose or other means, decided the contractor to attempt to lay the concrete base from a central concrete mixing plant. For mixing the concrete, whether the work be done from a central plant or in the usual fashion, a Koehring 18-E bucket-and-boom mixer will be used.

Both sand and stone are shipped in, and the cars are unloaded by means of a Jeffrey unloader working from a pit under the track. With this equipment, about five cars a day (about 200 tons) can be unloaded. It is planned to rig bins for sand and stone, and place underneath these a box with compartments for the proper amount of the aggregates. The unloader will work directly into the bins, from which the sand and stone will pass into the measuring box, and be dumped into the scoop of the mixer. By this means one handling of the aggregate will be eliminated, with its consequent waste and cost, and the number of men necessary at the mixing plant will be materially decreased.

Motor trucks will be used for hauling the wet concrete from the plant to the job. It is planned to so mount the mixer that, by means of the bucket and boom, the concrete can be dumped directly into the trucks. No serious settling of the aggregate is thought likely, especially with the rather short haul and the use of the pneumatic tires. Also, the trucks are constructed so that the body is raised to a steep angle for dumping, and this will facilitate handling the wet concrete.

ASPHALT SURFACE.

The asphalt mixing plant is located nearly in the center of the city, and about a mile or more from the probable location of the concrete mixing plant. An oil-burning "Iroquois" plant, manufactured by the Barber Asphalt Paving Co. is used. The nominal capacity of the plant is about 800 square yards per day, but to date it has been used entirely on patching and resurfacing jobs.

To provide storage space at the mixing plant, the contractor has constructed two concrete tanks, one for fuel oil and the other for asphalt. These are placed close to the mixer and are covered over to protect from fire or from impurities. They provide ample storage space, and at the same time protect against delays in delivery.

The binder course is mixed in batches of about 600 lbs. The percentage of asphalt on this runs, with the varying conditions of patching and resurfacing, from about 10 to 11.8 per cent. The average composition of the filler is: 200-mesh, 1.2%; 80-mesh, 19.1%; 40-mesh, 30.1%; 10-mesh, 29.4%; quarter-inch, 4.6%; half-inch 5.5%; three-quarter-inch 7.5%; 1-inch, 2.6%. With the wearing course, the mixture averages 71 pounds of asphalt, 88 pounds of filler and 441 pounds of sand. The screen results are as follows: 200-mesh, 1.5%; 80-mesh, 24.2%; 40-mesh, 37.4%; 10-mesh, 36.9%.

On the work so far done, but two trucks have been necessary for hauling the hot stuff. Trucks equipped with pneumatic tires seem especially suited for work of this sort, as better time can be made in traveling to and from the plant. Additional trucks will be employed when surfacing work is started on the main job.

For the grading, laying of a 5-inch concrete base mixed 1:3:6, and the construction of an asphalt pavement three inches thick, the price paid is $3.18 per square yard. The work is being done by the American Contracting Co., of Moultrie, Ga., under the direction and supervision of E. C. Derby, city engineer of Fayetteville.

A Practical Blue-Print Protector.

Blue-prints are always getting dirty, wet, greasy or torn while being handled by workmen using them.

An inventive genius has designed a very practical blue-print protector of simple construction and low cost.

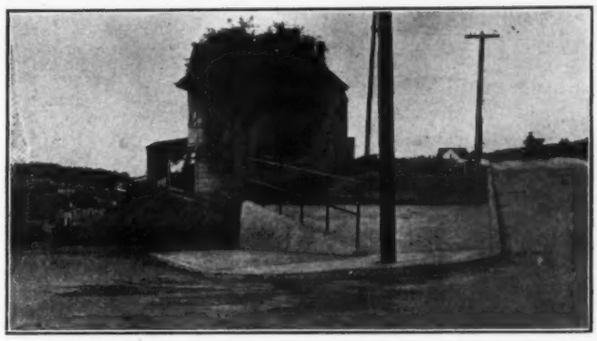
A sheet of transparent sheeting—the same material used for lights in auto curtains—is cut to desired size. A piece of light-weight leather substitute is then cut about a half inch larger all around than the piece of sheeting. This extra half inch allows for a lap-over on all but the top side of the protector. A sewing machine stitches the lap down to the sheeting forming a large flat pocket, open at the top for the insertion of the blue prints.

Both the transparent front and the coated fabric back are water-proof and grease-proof. Dirt or grease may easily be wiped or washed off, either without injury to the material. Both materials are flexible and the holder may be rolled up if desired in the same way an unprotected blue-print is usually handled by a workman.

A DIFFICULT SIDEWALK INTERSECTION.

The most difficult condition ordinarily encountered in designing sidewalk grades is the up-hill corner at the intersection of two streets both of which have steep grades. If the sidewalks on both streets slope downward toward the gutters, a wall, steps, or some equivalent construction seems to be necessary.

The illustration shows such a corner at the intersection of Circular avenue and Sunnyside avenue, San Francisco. This is an unusually difficult corner because the streets are not at right angles but form a "switchback." The height of the wall is so great as to be dangerous and it is rightly furnished with a railing to prevent accidents. While we are not informed as to the conditions not shown by the photograph, those that are evident indicate that some improvements could be made here. For instance, the large steel pole is placed at the narrowest part of the sidewalk, where it offers the maximum obstruction. It would appear to be possible to greatly improve this condition by placing the pole at the end of the curved curb on either street, or even one on each street, if necessary. Also the height of the wall could have been reduced by making it parallel with the upper rather than the lower street. We would suggest, also, that steps in place of the wall would look better and greatly increase the capacity of the sidewalk and shorten the walk around the corner; the foot of the flight being at the line of the foot of the present wall, and their top along a line parallel to the upper curb and passing through the near end of the present fence.



SIDEWALK INTERSECTION IN SAN FRANCISCO.

Sewerage and the Law

By John Simpson

Most court decisions have confirmed the broad powers of municipalities over sewer construction and maintenance, which the courts can not abridge; but the state can modify or restrict them; and they must be exercised in a reasonable manner. The regulations of most health boards, state and local, have the force and effect of law.

POWERS OF MUNICIPAL AUTHORITIES.

As a general rule, power to construct and maintain necessary sewers and drains is expressly conferred by the charter of the municipality, or by statute; and this power is usually liberally construed in favor of the municipality. In re De Peyster, 80 N. Y. 565; Anderson v. Lower Merion Township, 217 Pa. St. 369, 66 Att. 1116; Boyce v. Tuhey, 163 Ind. 202, 70 N. E. 531. Aside from the grant of express power, however, the power to construct and maintain adequate sewers is usually held to reside in all municipal corporations unless expressly denied to them by the legislature. Ft. Wayne v. Combs, 107 Ind. 75. 7 N. E. 746. The establishment of a sewerage system is generally looked upon as an exercise of the municipality's police power. Indeed, the right to exercise this power is considered of such importance to the public welfare that it is held it cannot be contracted or granted away. New Orleans Gas Co. v. Drainage Com., 197 U. S. 453; Metz v. Ashville, 150 N. C. 748, 64 S. E. 881.

Although, as a rule, the right to decide upon the necessity for and location of sewers and to order their construction, is vested in the municipal council or similar body, sometimes in conjunction with the mayor (Lingle v. Chicago, 172 Ill. 170, 50 N. E. 192; Anderson v. Endicott, 101 Ind. 539; Draper v. Fall River, 185 Mass. 142, 69 N. E. 1068) the power is sometimes conferred upon a department of public works, board of sewer commissioners, or other specified body. In re Wheelock, 51 Hun 640, 3 N. Y. Supp. 890, affirmed 121 N. Y. 664; in re N .Y. Inst. for Instr. of Deaf and Dumb, 55 Hun 606, 7 N. Y. Supp. 860.

In Maine, in which state municipal corporations have no power to construct sewers unless it is expressly conferred upon them, the power to construct sewers is, by general statute law, delegated to the municipal officers, a body distinct from the town itself, and for whose action the latter is not liable. Atwood v. Biddeford, 99 Me. 78; 58 Atl. 417; Bulger v. Eden, 82 Me. 352, 19 Atl. 829. In Chicago, the power belongs to the city and not to the Sanitary District of Chicago. Chicago v. McChesney, 240 Ill. 174, 88 N. E. 560.

The duty of constructing sewers may, of course, be made mandatory on municipalities by statute; but in the absence of such mandatory legislation, the general rule is that the municipality is the sole judge of the necessity or desirability of sewers, and their power of constructing and maintaining is therefore discretionary as to place and time, nature, capacity, number and cost. So long as the municipality does not exceed the limits of this power, the courts will not interfere with its exercise. Columbia v. Brooke, 214 U. S. 138; Clensay v. Norwood, 137 Fed. 962; Burton v. Syracuse, 37 Barb. (N. Y.) 292; Mills v. Brooklyn, 32 N. Y. 489; Michener v. Philadelphia, 118 Pa. 535, 12 Atl. 174; Fair v. Philadelphia, 88 Pa. St. 309; Hender-

son v. Minneapolis, 32 Minn. 319, 20 N. W. 322; St. Albans v. Noble, 56 Vt. 525.

Courts have no power to issue a mandatory injunction requiring a municipality to construct a sewer in a particular manner irrespective of the exercises of discretion vested in the municipal authorities to determine the practicability of the sewer, the availability of taxation for the purpose, and like matters. The exercise of this authority is primarily vested in the municipality and not in the courts. Vicksburg v. Vicksburg Waterworks Co., 202 U. S. 453.

STATE BOARDS OF HEALTH AND THEIR POWERS

The preservation of the public health is undoubtedly a proper and necessary exercise of the police power of the state. It is universally conceded that to prevent the spread of disease, and to perfect healthful and sanitary conditions, the government may enact laws and create boards invested with powers for that purpose.

The legislatures of nearly all the states have made express provisions for the establishment of state boards of health, charged with the general supervision of the sanitary condition of the state, whose duties are to examine into existing conditions, gather vital statistics, advise legislation, and make rules and regulations for the prevention of disease and the promotion of the public health. The statutes of the various states are very similar in their terms. In some states the establishment of state boards of health antedated the organization of local boards; in others, the legislature provided for both at the same time; though in the majority of cases their creation was subsequent to that of the local boards. Of recent years the tendency has been to increase the powers of the state boards at the expense of the local boards, and many functions are now discharged by them which were once considered the province of the city or county authorities.

Boards of health cannot, by their rules and regulations, enlarge or vary their statutory powers, and rules and regulations which are inconsistent with the statute creating the board and defining its powers or antagonistic to the general laws of the state are invalid. In re Keeney, 84 Cal. 304, 24 Pac. 34; Potts v. Breen, 167 Ill. 67, 47 N. E. 81. In re Smith, 146 N. Y. 68, 40 N. E. 497.

Frequently state boards and boards of subordinate political divisons exist together; the enactment of a law creating the one does not necessarily repeal that creating the other, but the statutes should be construed together. In a number of states, the state boards are required by statute to advise with the local authorities as to water supply, drainage, and similar matters; and in many others plans for new water supplies and sewerage systems must be approved by the state health authorities.

It is a general rule that, within certain limits, boards of health, both state and local, may be authorized by the legislature to make rules and regulations for the protection of the public health, and such rules and regulations have the force and effect of law within the district over which the jurisdiction of the board extends. Isenhour v. State, 157 Ind. 517, 62 N. E. 40; Hurst v. Warner, 102 Mich. 238, 60 N. W. 440; People v. Vandercarr, 175 N. Y. 440, 67 N. E. 913; People v. Special Sessions, 7 Hun. 214. But the extent to which this power may be delegated is a question of great difficulty.

A provision in the charter of a city empowered the city council to establish a board of health and define its power and duties. This clause was held to contain no warrant to the common council to delegate to or confer upon the board the powers and duties which they themselves were directed to exercise; otherwise there would be two legislative bodies within the city, with concurrent jurisdiction over this branch of its municipal affairs. State v. Street Com. of Trenton, 36 N. J. L. 283.

Where the legislature has authorized a board of health to legislate upon certain specified subjects, the courts can not review the acts of the board in pursuance thereof, in respect to matters within its jurisdiction. People v. Board of Health of City of New York, 33 Barb. 344.

The construction of private drains and sewers in violation of provisions inserted by a board of health with statutory power to determine the manner in which the drainage of buildings erected within the municipality shall be carried out may, under the New York statute, be enjoined by the board. Health Department City of New York v. Lalor, 38 Hun. 542.

The New York courts have held that, under the express provisions of the statutes providing for the organization of local boards of health, while the board of health of a town may not summarily execute its orders as to the abatement of a nuisance by going outside of the boundaries of the town for that purpose, it may invoke the aid of the court by injunction, to restrain a violation of its order and to enforce the abatement of the nuisance (in this case the discharge of sewage through a sewer of an adjoining municipality), although the cause thereof arises in an adjoining municipality. The facts of the case were that the city of Rochester acquired lands in the adjoining town of Brighton, opened ditches thereon and constructed sewers which discharged into the ditches near the boundary between the city and the town. The sewage was thus carried over the town lands into a creek. The board of health of the town of Brighton passed a resolution declaring that such discharge of sewage was a nuisance, ordered it to be suppressed and authorized the commencement of an action to restrain a violation of the resolution. The city in violation of the order continued the nuisance, which the board of health sued to enjoin. The New York Court of Appeals held that an action was maintainable to enforce the order and to restrain the continuance of the nuisance; that while the board could not go into the city and interfere with its sewers, it could enforce its orders and prevent the discharge of the sewage upon the lands of the town where it created a nuisance; and that the order related to a matter within the jurisdiction of the board. Gould v. Rochester, 105 N. Y. 46 reversing 39 Hun. 79. See also Bell v. Rochester, 58 Hun. 602, 11 N. Y. Supp. 305.

The local board of health of a town appointed by the local municipal government, sought to enjoin the board of freeholders of a county from discharging sewage from the public county buildings into a creek, so as to constitute a nuisance. Without deciding the point, the court questioned whether defendants, bound as they were by law to maintain county buildings, could be placed on the same footing in this respect as individuals. State v. Freeholders of Bergen, 44 N. J. Eq. 173.

RECENT SEWER LEGISLATION

Sewer legislation has been abundant in recent years. In many states statutes have been passed requiring the approval of the state board of health to the proposed installation of sewers and sewer systems by individuals and corporations, including municipal corporations, and giving the state boards other powers in respect thereof. These statutes, of course, may vary somewhat in their terms, and the limits of space prevent their details being given in this article. Those passed down to 1917 may be found in detail in Public Health Bulletin No. 87, November 1917, entitled "Stream Pollution," issued by the Public Health Service of the Treasury Department. Among the states which have passed such statutes are California,

Connecticut, Illinois, Indiana, Kansas, Florida, Maryland, Massachusetts, Michigan, New Jersey, New York, North Carolina, Pennsylvania, Ohio, Texas and Wisconsin.

As a rule, appeal may be had from an order of the state board of health to the district or superior courts of the state, by persons or municipalities feeling aggrieved by such orders, and on the other hand, the state boards of health may resort to these courts to enforce obedience to their orders.

CONSTITUTIONALITY OF OHIO STATUTE.

In State Board of Health v. Greenville (1912), 86 Ohio St. 1, the Ohio Supreme Court was called on to pass upon the constitutionality of the state statute of 1908 authorizing the state board of health to require the purification of sewage and public water supplies and protect streams against pollution. The constitutionality of the act was assailed chiefly because it provided for compulsory arbitration and because it coerced city officials into compliance with the orders of the state board of health. On these points the court gave its opinion in the following language, which is in large measure applicable to statutes of a similar nature more recently passed. "This particular legislation now under consideration is designed to preserve and protect the public health and comfort, and, therefore, falls directly within the police power of the state. This power includes anything which is reasonable and necessary to secure the peace, safety, health, morals and best interests of the public. It is now the settled law that the legislature of the state possesses plenary power to deal with these subjects so long as it does not contravene the Constitution of the United States, or infringe upon any right granted or secured thereby, or is not in direct conflict with any of the provisions of the Constitution of this state, and is not exercised in such an arbitrary and oppressive manner as to justify the interference of the courts to prevent wrong doing and oppression * * * The powers of a municipal corporation are delegated powers. It is a creature of statute over which the general assembly of Ohio has as sovereign control as it has over any other part of the territory embraced within the state limits, and the municipal legislature has such power only as the legislature of the state confers upon it, and it may grant or withhold at pleasure. A municipality is at best but a mere agency of the state, and its right to control its own local affairs rests wholly on the general grant of powers by the general assembly of the state. The state is still the sovereign and may extend, limit, or revoke these powers at will. In granting to a municipality certain powers to be exercised for the benefit of the public health of that municipality, the state has not relinquished its authority and control in this important particular over any of the territory contained within the limits of the state. The duties and powers of the state board of health extend throughout the state, irrespective of political divisions or territories embraced within municipalities * * * The provision in this legislation by which a municipality may challenge the judgment of a state board of health and submit the question to a board of arbitration composed of men skilled in sanitary work is a most liberal provision so far as municipalities are concerned, and is far more liberal than many of the statutes relating to the powers of a state board of health. There is no theory upon which a mere agency of the state has a right to litigate the right of the state to enforce, through any agency it pleases, sanitary rules and regulations for the preservation of the health and comfort of all the people of the state."

What had been said with reference to the first contention was held to apply equally to the second, the alleged coercion of city officials. "The state does not seek to control the discretion of the municipal authorities in this matter, but on the contrary refuses to commit to them any discretion touching the particular matters committed to the care and control of the state board of health. In so far as they are charged with any duty in reference to the carrying out of the orders and discretions of the state board of health, they are ministerial officers only * * *"

MARYLAND AND MONTANA DECISIONS.

In Welch v. Coglan (1915), 126 Md. 1, it was held that chapter 810 of the Maryland Acts of 1914, conferring upon the state board of health the power and authority to order the installation of water supply systems and systems of drainage and sewerage in any county, municipality or district, subject to the conditions and limitations contained in the act, is constitutional, but the reasonableness of the board of health's exercises of the powers conferred upon it by the act is always open to review by the courts. In the main, the Ohio and Maryland statutes are similar, but there are points of dissimilarity between them.

In an action by Miles City against the state board of health of Montana to annul an order issued by the board, prohibiting the city from emptying sewage into the Yellowstone river, it was held, Miles City v. State Board of Health (1909), 39 Mont. 405, that the fact that the state board of health did not hear testimony before it made an order prohibiting a city from polluting a stream which is a source of water supply for domestic uses, is not a valid objection to the order. Section 1566, Montana Revised Codes, under which the board acted, does not provide for a public trial, but contemplates an ex parte investigation by the board. The city was held to have the burden of showing, on appeal to the district court, that the order was not justified; hence, where it produced no evidence whatever, and the order, upon its face, bore no evidence of its own invalidity, the order was held valid.

Danger Signal for Safety Isle.

Safety stations or isles of safety are located along the street car track in Market street, San Francisco, chiefly as passenger stations. Several accidents have occurred by automobiles running into these at night and the board of supervisors has placed on each of them, on the end facing the traffic, a danger signal consisting of an electric light with a red globe. These have been appreciated by the motorists and approved by the Good Roads Bureau of the California State Automobile Association.

DANGER SIGNAL ON ISLE OF SAFETY.

Millville's Sewerage and Water Supply

By Boyd Trescott

A borough of 500 population used a sewer system for four years before it had a public water system, flushing it with roof water. The sewer cost 25 cts. a foot, laid. Reduction in fire insurance rates more than equaled fire hydrant rental.

The borough of Millville, Pa., was incorporated in 1892 and in 1899 had a population of between 500 and 600. It is situated on the east bank of Little Fishing Creek, the land for a mile east of the creek sloping gradually toward the west, the highest point being a knoll about 400 feet east of one of the main highways. The land here is a very close clay loam with a hardpan sub-soil and with water-bearing shale rock at depths varying from six to twenty feet. This made the construction of sumps and cesspools for disposing of the house wastes impracticable, as there would be no outlet for their contents and the ground water frequently rose to within a few feet of the surface.

THE SEWERAGE SYSTEM.

Although small, the town was closely built up and the problem of disposal of house wastes became serious, and in 1899 more than two-thirds of the property owners, in both number and interest, along two of the principal streets petitioned the council that sewers be constructed and the whole cost assessed upon the property owners. Although there was no public water supply for use in flushing sewers, it was decided to construct them and, by careful observation, determine whether it would be necessary to construct flush tanks to be operated by the overflow from certain springs. In the fall of 1899 about half a mile of sewers was laid on two streets with grades ranging from one per cent to seven per cent. The outlet was of 8-inch pipe and the two branches of 6-inch pipe. The pipe cost 5.8 cents per foot and was laid at depths varying from 4 to 7 feet at an average cost of 19 cents per foot for digging, laying the pipe, and backfilling. Thirty houses were connected at once. Provision for flushing was made by connecting to each line of sewer the roof-water leader from a building at its upper end. Four years later a public water supply was introduced, but even before this, the mains kept perfectly clean by the flushing provided by the roof water, and during its twenty years of operation, the sewer has never caused any trouble.

THE WATER WORKS SYSTEM.

In 1902 it was decided to build a water plant and a franchise was given to a private company for this purpose, specifying where the mains were to be laid and that the pipes should be not less than 4 inches on branches, with 6-inch connections between reservoir and town. The borough council agreed to pay $20 per hydrant per year for at least twenty fire hydrants. There were no springs or streams available which would give sufficient supply by gravity and it was determined to drill wells. An 8-inch well was drilled on the knoll at the highest point of the borough and at 500 feet depth there was a flow of 19 gallons per minute, which did not increase when the depth was continued to 1,000 feet. The water obtained was so impregnated with sulphur and iron that it could not be used and the project for a bored well was abandoned after spending more than $4,000. A shallow well was then dug near the creek and at a depth of about 15 feet loose sand was found which furnished a supply that seemed to be ample. This supply has been used since 1903, when the works were constructed and the consumption of water has increased from 16,000 gallons a day to more than 27,000. For several years the water was pumped by a gasoline engine but later this was changed to kerosene.

The fire hydrants were located not more than 1,000 feet apart and, with the 1,000 feet of fire hose bought by the council, it is possible to place two effective fire streams on almost any building in the town. It is found cheaper to pay the $20 per year for additional fire hydrants than to buy and keep on hand a larger quantity of hose, in addition to which the close spacing gives better pressure. Water is pumped to a reservoir on the knoll referred to, 190 feet above the creek, and gives a pressure on the main part of the town of about 80 pounds and a fire stream at 65 pounds . Just after the completion of the works, the Underwriters Association made a general reduction in insurance rates which more than made up, by the lowered cost of insurance, for the $400 paid out for fire protection.

Economy in Brick Pavement Construction

Deep gutters are objectionable. Curbs, either integral or independent, are a waste of money for monolithic construction or where bituminous filler is used. Penetration macadam shoulders recommended. The greatest present need is for better understanding of sub-soils. These opinions were expressed by Will P. Blair.

The vice-president and former secretary of the National Paving Brick Manufacturers' Association, Will P. Blair, in a paper before the American Society for Municipal Improvements, made several suggestions for modification of common practice in constructing brick pavements which would prove economical. One of these, the use of a rolled broken-stone base, instead of concrete, has already been referred to in the article entitled "Pavement Foundations," in the November 15th issue of Municipal Journal and Public Works. The others are described briefly in this article.

DEEP GUTTERS.

Gutters are sometimes found of a great depth, provided under the impression that they and the resulting high crown are necessary for surface drainage. Even if necessary for dirt roads, they are not for brick, they add to the cost, are inconvenient, dangerous and unsightly.

CURBS.

Where there are no sidewalks, curbs as an edging along a brick pavement are unnecessary in monolithic or semi-monolithic construction, or where asphalt filler is used. "The practice of making the curb an integral part of the foundation is more harmful than beneficial. A trough is formed, which holds the water, permitting it to subside into every chance crevice and opening in or underneath the pavement, instead of the needful provision for an unimpeded flow off of and away from the pavement." A curb independent of the base is of little use; in frost, raises it or, with the earth outside moist, it is easily pushed away from the base. A gravel, broken stone or slag embankment or shoulder is a far better protection, and one penetrated with bituminous material is far better. For brick-

paved country roads, therefore, "a curb is largely a useless and costly appendage" and a waste of $3,000 to $5,000 a mile. This does not apply to certain special conditions upon hillsides and through heavy cuts, where a curb may be necessary.

SUBSOIL CONDITIONS.

Destruction of pavements by traffic has received more attention than that by the subsoil conditions, although the latter exert a far greater influence on the durability of pavements than does traffic. We cannot even name or classify the various characters of soils with respect to their effect upon a pavement laid upon them. We drain or do not drain in a haphazard way, and generally continue the same design of pavement and method of construction for five, ten or twenty miles without making any change however different may be the soil conditions encountered. We are unable to direct how to deal with sand, clay or muck subsoils. In fact, the terms themselves do not convey any exact meaning, nor are there any others which do, concerning conditions as well as composition of the soil. "The absurd and unscientific way in which we have dealt with the underneath soil conditions in highway improvement, or our failure to deal at all with them, should bring us to realize that as highway engineers we have yet some work to do. To place reliance of sufficient support of traffic upon certain artificial slab strength of costly structure, without knowledge of what is already in existence and regardless of its worth for that purpose or without knowing with what small relative expenditure certain treatment may render its condition adequate, is but an acknowledgment of inability to economize and prevent great waste."

We need to be able to classify soils according to their capillary properties, then to determine what treatment to give each class in order to produce a stable foundation. This will be difficult, but must be done if we are to be sure of our ability to build satisfactory roads under all conditions.

Lawrence Sewage Treatment Studies

Excerpts from the latest annual report of the Massachusetts Department of Health. The details of the activated sludge process must be varied to suit different sewages; the process modifies but does not purify; too much sludge may be used; only one per cent of the applied oxygen is needed to produce stability. Studies were made of the progressive flow through sedimentation tanks. For sprinkling filters, the rate per acre can be increased as the square of the depth, or more. Acid wastes were found in sewers which dissolved iron and concrete but did not affect vitrified pipe or brick.

In the report of the Massachusetts State Department of Health for the year 1917, which has recently been published, are given the customary detailed descriptions of results obtained in the several experimental tanks and beds operated at the Lawrence Experiment Station, some of which have been in practically continuous operation for sixteen years. Most of these are in the nature of "progress reports," but concerning some of them tentative conclusions have been drawn. In the following paragraphs we have endeavored to present the most instructive of these.

ACTIVATED SLUDGE.

The activated sludge method is called "purification by aeration and growths" by the Lawrence experiment station, which is perhaps more accurately descriptive but is too long a name for common use. Strictly speaking, however, the name is applied by the station to include the use of slate tanks as well as activated sludge tanks. The year of the report was the fifth of the experiments upon the activated sludge process.

Two slate tanks were in operation and two activated sludge tanks, one of the latter on the fill and draw plan and the other on the continuous plan. The latter consisted of three compartments made of sections of 30-inch vitrified pipe set on concrete conical bottoms and about 75 inches high above such bottoms, with a capacity of 230 gallons each. The compartments are connected at the top in series and the first two have baffles across the center extending three feet deep. Until October 1st air was applied at the average rate of 0.94 cubic foot per gallon, when it was increased to 2.19 cubic feet per gallon of sewage. The amount of air applied appeared to be insufficient but represented the capacity of the air compressor used.

From these experiments it was concluded by H. W. Clark, who was in charge of the experiment station, that "it becomes increasingly evident, as stated in previous reports, that different sewages and sewages of different strength require very different periods of time and volumes of air if satisfactory results are to be obtained. The resulting effluent is, broadly speaking—unless excessive volumes of air and periods of time be given—a modified sewage but not a purified sewage. It is also evident that tanks operated on the fill and draw principle can be more efficient with a unit volume of air and time than tanks operated on the continuous principle. It is also evident that tanks containing slate produce purification with but a fraction of the air necessary in tanks not containing such material. Studies of sludge, not sufficiently developed as yet to summarize, seem to show that it is easy in this process to use an uneconomical and, in fact, detrimental percentage of sludge, and good results cannot be obtained unless sufficient air is used to produce sludge of a certain color and physical and chemical character."

In a previous report it had been stated that the increase of organic nitrogen which was found to take place in activated sewage sludge was largely due to the high nitrogen content of the colloidal matter deposited in activated slude from sewage, possibly aided by an apparent increase of nitrogen due to removal of carbonaceous matter by oxidation. This point was studied during the year.

The effect of sterilizing chemicals on the activated sludge process was studied and it was found that 5 c.c. of chloroform added twice daily reduced the number of bacteria but without sterilizing the sludge and sewage, and prevented the successful operation of the tanks. Mercuric chloride effected sterilization and completely stopped the action of the activated sludge—that is, no purification occurred. Experiments had been made and were being continued on the stabilizing effect of iron salts on the sludge, as it had been found to have such effect on Imhoff sludge. No results were given in the report.

During the year an effort was made to determine the actual amount of oxygen necessary to stabilize sewage of average strength, and the time required. It appeared that the average amount of dissolved oxygen necessary to produce stability in the sewage treated was 4.26 parts per 100,000 or 4¼ pounds for 12,000 gallons, or 350 pounds of oxygen per million gallons of sewage. In the activated sludge test, something more than two cubic feet of air was used per gallon of sewage, which amount was equivalent to the use (or rather waste) of 37,240 pounds of oxygen per million gallons of sewage—one hundred times the amount required to produce stability.

TIME OF SEDIMENTATION.

When water or sewage passes through a settling tank, the time for sedimentation or for passage of the sewage through the tank is generally expressed as the time it would take to fill the tank at the average rate of flow of the liquid under consideration. It is realized by all who are familiar with water and sewage treatment that part of the liquid passes through in much less time, while another part remains much longer in the tank, this varying considerably with the method of constructing and operating the tank.

Experiments at Lawrence were made on two tanks which were being operated at such theoretical rates that the sewage was 6 hours, 9½ hours, 10½ hours, etc., in passing through. The liquid on entering was treated with either salt or ammonium chloride so that its appearance at the outlets of the tanks could be determined easily, and also the proportion which the effluent at any given time contained of the sewage so treated. (These tanks were circular in the plan and it seems probable that the results founds with them would differ from those in a rectangular tank.) In the case of one tank, when the theoretical time of filling was 10½ hours, certain volumes of the applied sewage appeared at the outlet in practically one hour, 50 per cent appeared in 7½ hours and only after 35 hours had all finally passed through. The liquid did not pass through as a more or less compact body but as a progressive mixture. Theoretically, when a tank is operated on a 10-hour basis, 10 per cent of the entering sewage should appear at the outlet in the first hour, 9 per cent additional in the second hour, 8.1 per cent additional in the third hour, etc. This theoretical rate of progress was approximated by the actual results. During these experiments the sewage was being agitated with air.

Similar experiments were made in a tank 30 feet long 31 inches wide and 30 inches deep, the entering sewage passing below a baffle and rising above a baffle near the outlet, there being no agitation with air. When the flowing-through period was theoretically four hours, about 50 per cent of the entering liquid reached the outlet in four hours and it was 15 hours before all of it had passed from the tank. Where the times of passage were 6 hours and 8 hours, a little over a half had flowed through in those periods, but 20 hours and 27 hours respectively had passed before all had flowed through. In this tank the temperature of the water in different parts and depths varied from 38 degrees to 52 degrees, and these differences in temperature undoubtedly caused the water to flow in more or less stratified layers. Experiments along this line are being continued.

TRICKLING FILTERS.

Experiments were continued with three trickling filters, one of which had been put into operation in 1899 and the others in 1913 and 1914. One of the conclusions from the study of these filters was that "trickling filters of a considerable depth are much more economical and efficient than shallow filters, and this efficiency is due to two reasons: (1), to the fact that the sewage is relatively a much longer time in passing through the deeper filters, and (2), to the progressive mixture of the applied and the held sewage in these deep filters."

The experiments indicated that the greater efficiency of deep filters is somewhat more pronounced with a fine material (of such size that all pieces will pass a 1½-inch screen and be retained on a ¾-inch screen) than in the case of filters where the average volume of the pieces ranges from 25 to 30 c.c. Also that, for the maintenance of high rates with a good degree of purification, the finer material is more desirable than the coarser. Even with the latter, however, a filter 10 feet deep can be operated at a rate per foot of depth twice that of a filter 4 feet deep; or the actual rate in gallons per acre daily of a 10-foot filter can, even with the coarser material, be two and a half times as great as that of a 6-foot filter, while when using the finer material the rate of the 10-foot filter can be at least four times as great as that of a 6-foot filter and with equal purification results.

ACID IN SEWERS.

While investigating the treatment of wastes from various manufacturing processes, a spent sulphuric acid liquor was found which contained 1.95 per cent free acid, and another sample of partially spent hydrofluoric acid, so called, which was 2.45 per cent free acid (probably all sulphuric acid, however, as it did not etch the bottle containing it). It was found that these wastes dissolved 1.07 ounces and 1.42 ounces respectively of iron per gallon of liquor in 12 hours. The same liquors were tried on concrete blocks and at first the action was quite energetic, carbon dioxide being evolved; but after 24 hours this action had nearly ceased, the surface of the blocks being then largely composed of sand, the cement having been decomposed and the interstitial spaces filled with calcium sulphate. "When the blocks were placed in running water the calcium sulphate was dissolved, leaving the blocks ready for another attack by the acid; and by alternately applying acid and water, the blocks were completely disintegrated. As similar conditions would prevail in sewers, it is evident that such wastes should not come in contact with concrete or iron. The action of such liquors on vitrified pipe or brick was much slower, and after several months' contact with these wastes there was practically no evidence of injurious action.

Use of Federal Highway Equipment by States

As noted in our issue of May 10, 1919, the Secretary of War last year turned over to the Secretary of Agriculture about 20,000 trucks and other kinds of equipment useful for highway work, to be used by the several states in the construction of roads for which federal aid had been appropriated. How the state of Texas systematically arranged for the use of its quota of hundreds of trucks was described by Rollen J. Windrow, state highway engineer, in a paper before the Association of State Highway Officials last month. An abstract of the paper is given below.

The highway departments of the various states operate on two different bases. In twelve or more the state department takes the initiative in all matters pertaining to the construction and maintenance of state highways. But in the large majority the initiative rests with the county, parish or township, and the state highway department functions only in a co-operative or supervising capacity. In Texas the county is the operator, and consequently in that state the main idea is to get the equipment in the hands of the counties as quickly and with as little expense as possible.

The equipment supplied to the states may be classified as trucks, and all other. Up to the present, trucks far outnumber all other equipment allotted. In Texas, at least, the need for trucks will be largely supplied by the federal equipment, but in all probability not the need for portable crushers, road graders, steam shovels, rollers, tractors, concrete mixers, locomotive cranes, industrial track, etc.

The first definite information about the equipment was received in April, 1918; and in May the Texas Highway Department created a new division of the department known as the Federal Equipment Appropriation Division, in charge of a superintendent whose sole duty is the handling of the federal equipment.

The Bureau of Public Roads required that title to the equipment remain with the state highway department while the equipment should be in serviceable condition. It was therefore decided that it be distributed to the various counties on a lease basis and that the counties be required to execute a legal lease agreement, acknowledging accountability for the property received by them and accepting the stipulations as to conditions under which the equipment was to be used.

To protect its interests, the state department considered it necessary to provide for a regular inspection of the equipment after it was placed in the hands of the counties. Therefore the counties, besides paying reimbursement of receiving charges, were also required to pay an annual rental to cover the cost to the highway department of administering the control and inspection of the equipment. It had been estimated that a rental of two dollars per month on trucks would be sufficient to cover this cost and this is the rental which the counties are required to pay until the end of the first fiscal year. At the end of that time, this rental may be increased or decreased as found necessary and desirable.

APPORTIONING EQUIPMENT.

On the basis of the states receiving 20,000 trucks, Texas might expect her normal share of six per cent, or 1,200 trucks. Assuming that some of these would turn up unserviceable, that others would be needed in handling the federal equipment, and still further reserving a surplus for unexpected contingencies, it seemed safe to take 1,000 as the number which the counties might safely expect to receive. Using this as a total number, a table of distribution percentages was worked out for each of the 253 counties in Texas. The basis of this distribution is similar to that used by the Bureau of Public Roads in apportioning aid among the states, that is, on the basis of area, population, and mileage of roads; each of the three factors having equal weight.

Each county was then offered the number of trucks to which the calculation made it entitled. In making the offer, the counties were asked to submit their requests in the form of answers to a questionnaire which gave definite information as to the number of trucks the county would accept, whether less than or in excess of their allotment, information as to mileage of roads in their counties, expended and contemplated bond issues, amount of annual road and bridge fund, data in regard to the organization for road work, and other pertinent information. As other states have probably found in dealing with county authorities, it is exceedingly difficult to get information from all counties on any subject whatever. The State Highway Department of Texas used this opportunity, where they were giving something to the counties, as the best means of getting a large amount of miscellaneous information which had long been desired and which it had been unablee to obtain from all counties. The plan was almost uniformly successful and there are only a very few of the counties who have not fully and gladly replied to the questionnaire.

LEASE AGREEMENT WITH COUNTIES.

Regulations governing the use of the trucks are embodied in the lease agreement. The important points of this are as follows:

1. The truck is identified by state registration number, motor number and serial number, and by make and capacity.

2. Every item of equipment furnished on the truck is listed in the lease agreement and the county assumes full accountability for this equipment. This provision protects the state in case it is later found necessary to recall the truck from the use of the county.

3. The county agrees to keep the truck in a proper state of repair and good working order, due allowance being made for natural depreciation with use.

4. The truck is to be used on highway work only and on the public roads under the jurisdiction of the county commissioner's court.

5. The State Highway Department is to have full access to the truck at all times for the purpose of inspection, to insure that the provisions of the lease agreement are being carried out.

6. The county agrees to provide covered storage for the truck when not in use or to keep it covered with a waterproof tarpaulin, and further agrees to paint the truck once a year.

7. The county accepts full liability for the expense of receiving such equipment as is delivered to it. The county makes a payment of $150 at the time of executing the lease agreement, and agrees to pay such further sum as may be later assessed. Also, at the time of executing the lease agreement the county makes a rental payment at the rate of two dollars per month for the time remaining until the end of the fiscal year.

8. Provision is made for recall of the truck from the county by the State Highway Department upon giving two months' notice of such intent to recall and upon reimbursement to the county by the State Highway Department of all unearned rental and a certain per cent of the receiving charges which may have been paid by the county. The per cent of receiving charges to be refunded ranges from 100 per cent when the truck is recalled at any time up to three months after delivery of the truck down to 50 per cent when recalled after twenty-seven months after delivery of truck.

Some counties could receive their trucks by direct convoy, and the total cost, including making any repairs necessary, might not exceed $40 or $50 per truck. Other counties in the extreme western part of the state would receive their trucks by freight, for which the charges might be over $300 per truck. Also, it would cost as much to deliver a worn-out 2-ton truck of inexpensive make as a brand-new 3-ton truck worth two or three time as much. It seemed unfair to require the counties to pay as much for one as for the other, and the department established a scale of charges so that every county pays the same for the same make and type of truck, the rates being such that the total payments will cover the total receiving charges paid by the department.

DISTRIBUTING TRUCKS.

For distribution purposes, about a dozen distribution points were selected such that the longest drive to any county seat from the nearest distribution station does not exceed 200 miles and in the majority of cases is less than 100. Other factors affecting the selection of distribution stations were available storage, garage and shop facilities, availability of labor, railroad facilities, and highway connections to neighboring counties. In several cases storage space was secured at an army post or camp, in others at county fair grounds or warehouses. Thus the expense of renting storage space has been practically eliminated, and only at one station, and there for only a part of the time, was it necessary to rent space for storing and repairing trucks. An inspector was sent to each station to make the arrangements for storage, purchase of supplies, and employment of labor.

When the State Highway Department at Austin receives notice by wire that certain trucks are available for immediate shipment, complete shipping instructions are wired to the Bureau of Public Roads, which are transmitted through the chief of the Motor Transport Corps to the Army supply depot where the trucks are stored. The trucks are then shipped to the distribution station specified and an inspector immediately sent there to receive them. As soon as they arrive they are checked over and a complete list of all equipment is sent to the office of the state department, which then sends acknowledgment of receipt to the Bureau of Public Roads, the chief of the Motor Transport Corps, and the shipper, and pays the bills for loading and freight.

The inspector employs a first-class mechanic, and drivers and laborers. The trucks are gone over thoroughly, greased, oiled, their motors tuned up, all necessary repairs made, and they are tried out to make sure that they are in first-class condition. Meantime authorizations are made out in quadruplicate, two going to the county judge, one to the inspector, and the fourth into the office files. The county judge is instructed to have a representative call on a certain date for the trucks allotted to his county, bringing his two copies of the authorization, which are to be signed by this representative and the department's inspector. These two check over the equipment as described in the authorization, the signing of which acknowledges the receipt of it by the county, and each delivers one of the copies to his own office. The trucks are then taken over by the county's representative.

A lease agreement is made out in duplicate and both copies sent to the county judge with a statement of preliminary charges, his signature and that of the four members of the Commissioner's Court are placed on each copy and they are returned to Austin accompanied by a check for the bill rendered. One copy is returned to him signed by the state highway engineer and the other is filed in the state office. Later, when the complete charges against the equipment become known, the county is billed for the balance due.

By the first of December the state had received about 35 per cent of the trucks allotted to it, but so small an amount of other equipment that no attempt had been made to distribute it, it not even being known how much of such equipment the state would receive. What is received is put in serviceable condition and stored and probably all will be distributed next spring under a plan of leasing similar to that employed for the trucks.

USE OF TRUCKS BY CONTRACTORS.

In the matter of rentals to contractors and force account jobs, the State Highway Department of Texas approves three different schemes on which this may be carried:

1. Where the equipment is available in the county at the time the contract is to be let, the county may advertise for bids on the basis of furnishing the contractor with certain specific equipment.

2. The county may lease the equipment to the contractor for a certain specified cash price, but such contracts must be submitted to the State Highway Department for approval.

3. The county, as a private party, may haul for the contractor on a ton-mile basis at the usual pay for such work, the county using its own trucks and drivers.

In this matter of rentals to contractors and force account jobs, every individual case must necessarily be examined on its own merits and the division engineers of the Highway Department, who are in close touch with all the counties, make recommendation as to what action the department should take in each case.

The State Highway Department intends to exercise its control over this equipment by maintaining frequent inspections. The state is divided into eight districts with a division engineer as the official representative of the State Highway Department in each district. Divisional inspectors have been put on in these districts and these men work under orders from the division engineer. Their duties involve the inspection of this federal equipment, submitting necessary reports in re-

gard to the use and possible misuse of this equipment and other matters pertaining to traffic regulations and registration of the motor vehicles. The division engineer, in his visits to counties, also transacts some of this business and in this way the highway department is enabled to maintain a close supervision of the use of this equipment.

EQUIPPING TRUCKS WITH DUMP BODIES.

Because of the great area of Texas, the expense of having all the trucks brought to one point to be equipped with dump bodies hardly seemed justifiable; nor was it possible to have all the trucks which were going to any one distribution station shipped to that station at one time. As the counties were asked to bear the full expense of receiving the trucks, they should be permitted to decide what type of bodies they wanted on them. Accordingly, this matter was left entirely to the individual counties.

There is one phase of this matter, however, in which the State Highway Department has taken the initiative. It experimented with cutting down the steel ammunition body with which the Nash Quad trucks were equipped and found that this can be made into a practical dump body by removing the steel body from the chassis, cutting same down with a blow torch to a depth of 15 inches, riveting a small angle-iron around the cut edge, and equipping the body with a swinging tail-gate at the back end, and mounting same back on the chassis with a hand hoist attached between the body and the cab. Business firms in Texas do this work at a price which affords a saving of from $100 up over any other steel dump body which the department has thus far been able to obtain.

Some Novelties in Concrete Paving

A truck, loaded by a crane, delivers stone for six batches, automatically measured, directly into the mixer skip. Sand is shoveled into skip and measured with one handling.

A piece of concrete road is being constructed at Central Islip, L. I., by the R. W. Smith Corporation in which the contractor is using some interesting appliances and methods for meeting the labor problem by the use of machinery. As one of his machine operators stated, Mr. Smith "believes in buying machinery rather than labor wherever possible."

The pavement in question is a section of the highway running between Islip to the south and Smithtown to the north. The pavement is 16 feet wide, 5 inches thick along the edges and 7 inches along the center and is mixed 1 cement, 1½ sand and 3 broken stone; the sand containing more or less small gravel. This road crosses the railroad at right angles, at a point only about 200 feet from the siding where the contractor has piled the broken stone delivered for the work. The sand is obtained about two miles away and has been distributed in a continuous pile along one side of the road to be paved. The road had previously been graded by use of a Maney scraper, from 2 or 3 inches in some places to 18 in others having been removed from the crown.

For side forms for the concrete, 4-inch steel channels are used, held in place by means of half-inch iron pins driven through holes in the flanges and into the ground. Water for the concrete is brought for a distance of two miles through a line of 2-inch pipe laid along the side of the road, a booster pump being used about a half-mile from the plant to provide sufficient head to lift it into the water tank on the top of the mixer.

For mixing the concrete, a Foote batch mixer with caterpillar traction and discharging the concrete through a chute is used. While the concrete is seasoning it is covered with sandy soil which was removed in grading and piled alongside the road; or, where there was not enough of this, with soil "borrowed" alongside the road.

HANDLING THE AGGREGATE.

The unusual features are the methods of delivering the aggregate into the mixer. At the stone pile at the railroad siding is a Beyer's auto-crane which is used for loading the stone from the pile directly onto the trucks. The crane also has caterpillar traction. A bucket is used which lifts about three-quarters of a yard of stone at a time, and fills the truck with three or four buckets-full. The truck used on this work carries 2 2/3 cubic yards of stone. The truck is of a design known as the Brockway, with a special design of dump body, the unusual feature consisting of five partitions in the body dividing it into six equal sections, each section holding exactly the right amount of stone for a batch. Each of these partitions swings from a rod passing across the top of the body, but is held in vertical position by three pins which enter holes in the steel bottom of the body, and which pins can be withdrawn from the holes by means of short-arm knuckle joints operated by turning the supporting rod by means of a handle at the outside of the body. When the truck is to be emptied, the front end is elevated by means of a piston lift, the swinging tail-board is released, and the stone from the first partition is discharged. The second charge of stone is discharged by releasing the first partition by withdrawing the pins as above described, and each successive charge is discharged when desired in the same way. As the compartments all have the same calculated dimensions, exactly the right amount of stone is discharged each time without measuring.

In practice, the truck backs up to the skip of the concrete mixer, discharges the stone from one compartment, and while this is being mixed the skip is lowered and stone from another compartment is discharged into it, and so on, until six batches have been mixed, when the truck returns to the stone pile for a new load. Meantime, another truck has arrived similarly loaded and takes its place for delivering stone into the skip. As batches are mixed at an average interval of 1¾ minutes, each truck stands at the mixer for about 10 minutes. The work at present is about 1,800 feet from the stone pile, and only two trucks are needed, since one can go to the pile, obtain a load and return in less than 10 minutes. The crane can load the truck in 1½ minutes, although 2 or 2½ minutes is probably more nearly the average loading time and there would be no advantage in reducing this time. Each section of the truck holds about 12 cubic feet, and this amount of stone is mixed with 6 cubic feet of sand and 4 bags of cement to make a batch.

As already stated, the sand is piled up in a continuous pile along the side of the road only three to five feet from the edge of the pavement, and is shoveled directly into the skip. In order to measure the sand, a bottomless box of the proper dimensions is set on the flat

bottom of the skip and is filled with sand by two or three shovelers. Following this, the stone is dumped upon the sand and the four bags of cement emptied onto the pile, and the aggregate is then discharged into the mixer. The sand box is not removed before the stone is placed in the skip, but it is fastened by means of two chains to a steel brace connecting the tops of the sides of skip, and when the charge is discharged into the mixer, the box swings free and hangs suspended from this cross-brace, returning of itself to the bottom of the skip when this is lowered to the ground.

It can be seen that this method of handling aggregate insures accurate measuring and also eliminates the wheelbarrow gang, and, in fact, all handling of the stone except picking it up by the crane, and requires only one handling of sand. Including foreman and engineers of crane and mixer, the total number of men employed on the work is 20.

The truck body is 4 feet 9 inches wide inside and 1 foot 9 inches deep and the partitions are spaced 1 foot 8 inches apart. Each partition is formed of a 1-inch board with a thin steel plate on each side, the plates being held in place by bolts passing through the board. On the basis of 1¾ minutes to a batch, which lays three square yards, this small gang and apparatus would lay 465 feet of 16-foot pavement a day. As in all cases, there are delays connected with moving the mixer and other features of operation, but the distance actually made is between 400 and 450 feet, although as much as 525 have been laid in a day.

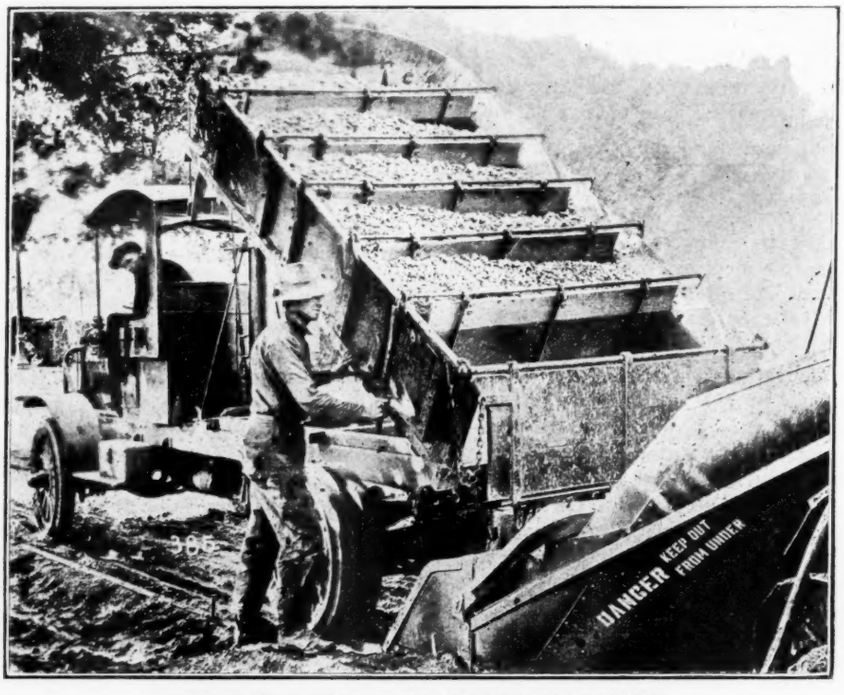
The concrete pavement is struck off by means of a strike board made of a 2-inch by 12-inch plank properly formed on the under edge to give the 2-inch crown desired. The surface is finished by means of a 1-inch board 8 inches wide which is provided with a handle at each end and is used in much the same way that a belt has been used for the same purpose. This also is believed to be an unusual practice.

St. Louis Filter Notes

The 1919 report of August G. Nolte, superintendent of the filter plants of the St. Louis waterworks, contains a number of interesting matters, among them the following:

It was found that fish in the water above the filters, mostly carp, were making holes in the surface of them, from one inch to mere depressions in depth and as large in plan as one by two inches. The fish varied in size from mere minnows to 6 inches long, averaging 3 inches. The depth (4½ feet) and turbidity of the water above the sand prevented seeing how the holes were made, but it was supposed that they were due to the impact of the fish striking the aluminum hydroxide matting on the surface of the sand, either while swimming downward with the current or while nibbling for food. There was no doubt that the depressions were due to fish, for the holes are always found when fish are present and vice versa. They did not appear to interfere with the efficiency of the filters.

Some of the strainer plates had not been fastened down firmly, the U-bolt nuts not having been drawn up all the way, and this allowed the water to rush out at the edges and throw up mounds of the gravel resting on the adjoining plates. For locating these mounds, a T was made of ¾-inch pipe, the vertical leg 15 feet long and the horizontal about 6½ feet. While the sand was held suspended by wash water, this T inverted, was moved inch by inch across the filter unit parallel to and between each two lateral gutters. Where the gravel surface was level the upright leg of the T would stand vertical, but any unevenness in the surface would tilt it. This investigation also revealed the presence of large mud balls in several of the filters, which were broken up with a rake. Loose strainer plates were found in nine of the forty filters. Repairs to them were made by regrouting the plates, drawing up the nuts and replacing the gravel.



HIGHWAY TRUCK WITH PARTITIONED BODY.
Skip-man preparing to dump second partition into skip.

The WEEK'S NEWS

Funds for Indiana Highways Limited—Propose Transcontinental Highway for Canada—Convict Road Work in Florida—U. S. Public Health Service Plans Health Conservation—Malaria Control by Rockefeller Foundation—Improving Water Supplies of Virginia Cities—Atlanta Adopts and Newport Defeats Two-Platoon Plan—New York Aids Policemen—Canton Mayor Removed by Governor—Toledo Cars Run Again.

ROADS AND PAVEMENTS

Highway Program Delayed by Financial Complications.

Indianapolis, Ind.—The financial complications of the state administration have become more involved with the announcement that the state highway commission will not arrange to let contracts for the building of more state roads in 1920 owing to its lack of funds. The commission planned to let contracts before the first of March for the construction of four hundred miles of hard surface roads next year, but Luke Wright, chairman, has now announced that it cannot build more roads because it cannot get the funds. The commission has arranged to build 133 miles of roads and has funds for that purpose. However, the outlook is that the plan for a state system of highways will have to be postponed at least a year, and probably longer, on account of the action of the state tax board in reducing the highway levy from 10 cents on the hundred dollars to 3.9 cents. The last legislature passed a law giving the highway commission a 10-cent levy, but the tax board refused to permit the collection of that amount, although the highway commission and good roads organizations contend that the tax board has no authority to override the action of the legislature. It was stated at the office of the highway commission that the state probably will lose a large portion of the sum it would have received from the federal government if the state tax board had not cut down the levy for road building. It was stated also that as a remedy to the situation a bill will be presented if the special legislature is held to double the auto license fees, which would give the highway commission at least a million dollars extra for next year. The tax board is confronted with dozens of suits to test the new law, and one has been appealed from here questioning the board's right to place horizontal increases on all property, as was done in three-fourths of the counties. If the decision here, which was against the board, is upheld, practically every city and county will be bankrupt next year. Fred Sims, chairman of the tax board, is suggesting in the event of an unfavorable decision by the supreme court that the legislature in special session legalize the horizontal increases.

Daily Reports on Road Conditions.

Harrisburg, Pa.—The state highway department has begun the making of daily reports on road conditions to meterologists of the weather bureaus in Philadelphia and Pittsburgh. These bureaus will in turn inform motor clubs, manufacturers and the public in general of the condition of the main connected hard-surfaced highways over which east-west winter traffic passes. This service will cover the Lincoln Highway between Philadelphia and Pittsburgh; the National Pike within the boundaries of Pennsylvania; the highway between Chambersburg and Harrisburg; the William Penn Highway between Harrisburg and Philadelphia, and the William Penn Highway between Reading and Easton. Each of these thoroughfares has been divided into sections. Superintendents in the various counties each day will mail to the weather bureaus and to the state highway department cards giving the condition of the roadway by sections. If any marked changes occur during the night, telegraphic reports will be made the following morning. Farmers, manufacturers, automobile clubs and road users in general who wish accurate information regarding the condition of the main traveled roadways mentioned may secure that information either from the weather bureaus in Philadelphia and Pittsburgh or the bureau of information, state highway department, Harrisburg.

Canada May Duplicate Lincoln Highway.

Ottawa, Canada.—The Lincoln Highway may soon be duplicated in Canada. Definite plans have been formulated for the organization of an association along the same lines as the Lincoln Highway Association, pledged to construct a great transcontinental road from Halifax to Vancouver. A. F. Bement, vice-president of the organization in the United States, has been invited to address the Ontario Motor League in the near future and describe the steps to be taken.

Extensive Convict Road Work in Florida.

Jacksonville, Fla.—Bids will be asked for and contracts probably be let by January 10, by the state road department for approximately $2,000,000 worth of road construction. This was announced by John E. Gilbert, a member of the department, upon his return from a conference with chairman M. M. Smith at Tallahassee. According to Mr. Gilbert, all of the nineteen convict camps to be maintained by the road department are practically completed and about 750 convicts will be available the first of the year. Three of the camps will be located between Jacksonville and Lake City on state road No. 1; two in Hamilton county on state road No. 2; one in Gadsden and one in Bradford county The convicts will be kept in portable stockades. In providing for their clothing, sustenance and equipment the state road department has assembled large quantities of supplies at Camp Johnson.

SEWERAGE AND SANITATION

Urges Nationwide Health Conservation Plan.

Washington, D. C.—"Preventable disease cost the United States four billion dollars less in 1917 than it would had the health conditions of 20 years ago prevailed in 1917. Four hundred thousand less deaths occurred in 1917 than would have had the 1900 death rate prevailed. Annual illness of workers still costs this country two billion dollars each year. One man in every three called by the army was found to be physically unfit." These figures have been given out by Surgeon General Rupert Blue of the United States Public Health Service, in urging a plan for nationwide conservation of health and calling on all health agencies to co-operate in a carefully prepared program. Surgeon General Blue has sent a letter to state and city health officers, to the head of the American Red Cross, the American Public Health Association, the American Medical Association, the National Tuberculosis Association, the International Health Council, the National Safety Council, the American Child Hygiene Association, and other health agencies, suggesting a conference in Washington to consider a health program prepared by the Public Health Service. The Surgeon General points out that practically all of these agencies have under consideration some plan of health conservation and that unless the work can be coordinated and properly directed, little will be accomplished and there will be much overlapping of effort and waste of

funds. It is emphasized that the success of the plan will be determined by its direct applicability to the conditions in the different local communities and for this reason the Federal, State and local health officers must co-operate most closely in order to direct the campaign in each community and set a definite objective. The health program to be submitted to the conference has been in preparation for months, experts of the Public Health Service long having foreseen the need of such a nation wide effort. A preliminary announcement of the plan was made at New Orleans at the recent meeting of the American Public Health Association, which gave unanimous endorsement.

Damages for Typhoid from Polluted Water.

Rochester, N. Y.—A case (Stubbs v. City of Rochester, 124 N. E. 137) recently decided by the New York Court of Appeals involves the liability of a city to respond in damages for furnishing polluted drinking water which it was claimed caused typhoid fever. The city of Rochester has two systems of water supply, one for domestic use and the other for fire purposes and for sprinkling the streets. The potable water became contaminated and polluted by mixture with the other supply which came from the Genesee River. The plaintiff became ill of typhoid fever and sought to recover damages from the city, claiming that his illness was caused by drinking the polluted water and that the city had been negligent in allowing the water to become polluted. The evidence showed that there were many more cases of typhoid fever in the city during the period that the water was polluted, and that many persons who had drunk the polluted water had contracted typhoid. The health officer of the city gave it as his opinion that the plaintiff contracted the disease by drinking polluted water. It was shown that infection with typhoid fever can be acquired in several ways, and it was contended in behalf of the city that the plaintiff had not proved that the polluted water had caused his illness. The lower court dismissed the complaint on the ground that the evidence for the plaintiff was insufficient as a matter of law. The court of appeals, however, held that the facts should have been submitted to a jury, which would afford the plaintiff an opportunity to prove, if he could, that the infection was caused by the drinking water. A new trial was granted.

Malaria Control Methods Successful.

New York, N. Y.—Results in controlling malaria in rural districts of the Southern states are recorded in the latest report of the Rockefeller Foundation. After telling of destroying the breeding places of mosquitoes and screening houses, immunizing the individual with quinine and sterilizing the blood of human carriers, the report reviews the initial experiment at Crosset, a lumber town of 2,129 in Ashley County, Arkansas. Climatic conditions and abundant breeding places favored the offending type of mosquitoes, malaria was widely epidemic and physicians of the regions estimated that it was the cause of 60 per cent of all illness. The program of eradicating breeding places was restricted to such measures as the community itself well might carry out, and was aimed at a reasonably high degree of control at minimum cost. The first conspicuous result apparent was the practical elimination of the mosquitoes as a pest, the report says. The reduction in malaria, as shown by a parasite index taken in May and again in December, 1916, was 72.33 per cent. Physicians' calls for the year were reduced 70.36 per cent, compared with the previous year. At the end of the year the community took over the work and carried it on for two years. This table shows the results:

PHYSICIANS' CALLS FOR MALARIA.

Population	2,129
1915 calls (company's records)	2,500
1916 calls (company's records)	741
1917 calls (company's records)	200
1918 calls (company's records)	73
Reduction for the three years	97.1%

PER CAPITA COST.

1916 (omitting overhead)	$1.24
1917 (total cost)	.63
1918 (total cost)	.53

Operations then were transferred to the neighboring towns, the achievements being thus summarized:

PHYSICIANS' CALLS FOR MALARIA.

Population	1,285
1916 calls	2,312
1917 calls	259
1918 calls	59
Reduction 1916-1918	97.4%

PER CAPITA COST.

1917 (omitting overhead)	$1.45
1918 (total upkeep)	.44

There followed experimental control in four Mississippi towns, the acheivements being thus summarized:

	Lake Village.	Der-mott.	Monti-cello.	Baux-ite.
Population	975	2,760	3,023	2,500
Physicians call for malaria:				
1916	1,817	1,399	1,413	862
1917	1,388	1,248	1,274	729
1918	83	162	137	172
Per cent reduction, 1917-1918	94.8	87.8	80.8	78.4
Per capita cost, 1918	$1.25	$0.54	$0.46	$1.11

"Comparison of cost of operations with results accomplished in these six towns, tends to show that malaria control in such communities, considered merely as a business proposition, pays," the report continues. At two dollars per physician's call, Crosset has been paying annually more than four and one-half times as much in doctor's bills alone, for the privilege of having malaria, as it expended in 1918 for the upkeep of the work which kept it practically free from malaria and from the mosquito as a pest. Hamburg's annual doctors' bills for malaria had been eight times the cost of protection in 1918. In the four new communities, the annual payment for physicians' calls would cover even the relatively heavy cost of first year operations almost one-and-one-half times over. And the doctors' bill is but an insignificant fraction of malaria's total cost to the community.

Turning to a discussion of the work in rural districts where mosquito elimination is not practicable, the foundation reports on the first screening experiment on a group of cotton plantations near Lake Village, Ark. The people were taught the importance of maintainng the screens by house to house visits. Most of the population were negroes of average plantation intelligence, yet from the apparent average infection of 11.97 per cent at the beginning of the work, a parasite index at the end of the year showed a reduction of 70.6 per cent. The average annual per capta cost of screening was found to be $1.75. Similar results were attained on another plantation at a per capita cost of 57 cents.

Setting forth, that since all infected mosquitoes have derived their infection from the blood of infected persons, it is possible theoreticaly to prevent the spread of the infection in a community by destroying the parasites in the blood of the human carrier, the report tells of a two-year field experiment along this line in Bolivar County, Miss. A large number of blood examinations showed that persons who have had clinical attacks may carry the parasites in their blood for months, and demonstrated that the usual physician's treatment does not sterilize the blood.

These tests establish the fact that ten grains of quinine a day for eight weeks sterilized the blood of about 90 per cent of the carriers to whom it was administered.

WATER SUPPLY

Cleveland Loses Contract Bond Suit.

Cleveland, O.—The city loses $262,000 through the decision of the Ohio supreme court at Columbus in refusing to hear the case of the city against W. J. Gawns, contractor. Gawns had the contract for building a waterworks tunnel under Lake Erie but gave the job up after working on it for five years. The city was trying to collect the $262,000 from the Fidelity & Deposit Co. of Maryland, surety for Gawns.

Virginia Cities Improving Water Supplies.

Richmond, Va.—According to figures prepared by the sanitary section of the state department of health, of which Major Richard Messer is chief engineer, 800,000 Virginians are drinking water, the sanitary condition of which has been improved by one or other of several ways during the nine years' existence of the department. During the year new filter plants were completed at Lynchburg, Alexandria, Langley Field, Camp Humphries and Quantico, while at Shenandoah, Franklin, and Fieldale filter plants are nearing completion. Additional filters were constructed at Suffolk. During the nine years, 30 new waterworks systems have been installed in communities having an aggregate population of 66,000 people; 25 new filter plants have been provided, serving a population of 125,000, and about 40 liquid chlorine plants have been installed improving the water supplies of populations aggre-

gating 650,000. In this connection it is of interest to note that morbidity returns just completed for the year ending September 30, 1919, show a still further reduction in typhoid fever deaths. For the fiscal year just closed reported deaths from this disease numbered 2,221, the department's estimate for the state being 3,535. For the year ending September 30, 1918, reported typhoid numbered 2,374, and the estimated aggregate was 4,016. In the first fiscal year of the department, before the installation of improved water supplies in many towns and cities, estimated deaths from this one disease, in Virginia, numbered 14,398, or well above 1,000 a month.

STREET LIGHTING AND POWER

Orders Reduced Gas Price for Low Pressures.

Oklahoma City, Okla.—A supplemental order made by the Corporation Commission takes up the old "efficiency service" order of the commission on use of gas of several years ago, and makes it mandatory on the part of gas distributing companies to make deductions in gas bills to consumers. The previous order required gas companies to place pressure gauges on pipe lines, and any time these showed less than four ounces, the company was compelled to report such to the commission. In addition to this, the new order requires the gas companies to make deductions in gas bills, according to the pressure as actually shown. If the pressure is less than four ounces and more than three, the bill must be only 75 per cent. of the rate; if less than three and more than two ounces, 50 per cent. of the rate; if less than two and more than one ounce, 25 per cent. of the rate, and less than one ounce is considered no service at all. It is further ordered by the commission that no customer is to be discontinued if he refuses to pay a gas bill when presented, where there is a controversy. The "efficiency order" promulgated by the commission several years ago has been upheld by the Supreme Court.

Big Interconnection Scheme for English Power Plants.

London, England.—Plans are in course of preparation for the erection of a new generating station on the banks of the river Trent, to supply an area of 2,000 square miles, 50 miles from north to south, and 40 miles from east to west. The area includes parts of Nottinghamshire, Derbyshire, Staffs, and Leicestershire. The first section of the station would cost £5,260,000, but supply authorities from Chesterfield to Leicester, on the one hand, and Burton-on-Trent to Newark on the other, would co-operate and bear a proportion of the cost. It is estimated that the whole scheme will require about £14,000,000 to carry through, but it means much cheaper power, and would result in a saving of £40,000 per annum to the Nottingham Tramways alone. At the station, which would occupy at least 100 acres of land, many advantages are offered—an ample supply of condensing water, facilities for bringing coal by water and rail, for the disposal of ashes and coal storage, and, what was very important in future, a carbonization plant. The capacity of the station would be 200,000 kw., and it would require 580,000 tons of coal per annum (or 1,500 tons daily) and 14,000,000 gallons of river water per hour. This scheme is at present under consideration by the engineers and representatives of the various authorities concerned, but progress cannot be made until the Electricity Supply Bill becomes law, when no doubt the schemes will be submitted to the government department concerned and to the authorities which will be set up for dealing with electricity supply generally.

FIRE AND POLICE

Two Platoon System Adopted.

Atlanta, Ga.—The city council has approved the plans to inaugurate a two-platoon system for the fire department and to pay to the widow of any fireman killed in the discharge of his duty his salary for one year. The ordinance will go into effect on January 1. The firemen presented a lengthy petition, asking that council take favorable action and a letter, approved unanimously by every member of the city fire fighters, as follows, in part: "We realize that the inauguration of the two-platoon system will increase the expenses of the fire department as much as the financial condition of the city will justify for the year of 1920. It is our earnest desire to be reasonable and fair in all our relations with the city and to show due appreciation for favors granted us. We, therefore, promise that we will make no request for an increase in salaries during the year 1920, if favorable action is taken by council upon our above petition. We recognize that the public character of our occupation, which is essential to the public welfare, imposes upon us a paramount duty of service to the public. We realize that a strike by the fire department, or by a union representing a large majority of the members of the fire department, would be inimical to the public welfare and contrary to the obligation which firemen owe to the public. For the foregoing reasons, we expressly disclaim and renounce any right to strike, either as a member of the fire department of the city of Augusta or as members of Firefighters Union No. 175." The only expense the adoption of the two-platoon system will mean will be the salaries of twelve additional firemen.

Two Platoon System Defeated.

Newport, R. I.—At the recent elections held here the proposal to institute the two platoon system in the fire department was defeated. The vote was 405 in favor and 1,823 against.

Special Food Stores and Hospital for Police Welfare.

New York, N. Y.—With the aid of a staff of prominent citizens who are interested in the welfare of the city, asking no compensation for their endeavors, special deputy police commissioner Julien Stevens Ulman is rapidly developing his plans for the Home Service Division of the Police Department. The first big undertaking is the opening of the community stores, which it is believed will result in the greatest solution for the reduction of the high cost of living yet hit upon. With half a dozen of these stores already in operation in Brooklyn and as many more soon to open in Manhattan, the problems of policemen and their families will be greatly lessened. Henry F. S. Williams has been appointed honorary deputy chief of police and will have direct charge of the chain of police department stores. About 75,000 people will benefit by the efforts of Commissioner Ulman and his aids, for they mean not only to reach the members of the active police force and their dependents, but those on the pension list of the Police Department and also the widows of policemen will be able to enjoy the advantages of the stores. At present the stock in the stores will be limited to food commodities. The articles are being sold at cost plus 5 per cent for overhead expense. This small overhead expense is made possible by having the stores in the police stations. The reservation of space in the station is also advisable because of the great convenience to the policemen, for they can shop for their family at some hour in the day without journeying to a distant point. The purchases can also be made by members of the families, for cards are to be issued, and, with the proper identification, will be honored.

"The Home Service Division will not stop at selling the necessities of life to the men," said Commissioner Ulman, in discussing his plans. "It will broaden out as we progress, and that will be very rapidly, I am sure, for I have been very fortunate in enlisting the aid of such able men. We hope very soon to be able to help a member of the department with advice and material aid, no matter what his needs may be. If he needs financial help, he will be able to come to us, and a confidential arrangement will be made with him which will tide him over his difficulty. In the near future we expect to build a hospital, where the members of the department and their families may go for medical treatment.

"While our program is still very much in the making so far as visible results are concerned, I believe we have given the first great incentive for the working out of the serious problems confronting the people of this country on the necessary commodities of life. There is no doubt that these humanitarian formations to reduce the cost of living will become more general throughout the United States within a short time.

"We are very gratified at being able to so cut the current prices at the stores. We find in some cases that we are able

to sell at as much as 50 per cent less than the average store. By using the stations the overhead expense will be eliminated and the slight advance over cost will just pay the expenses absolutely necessary. Since the average overhead expense of the chain stores about the city is 38 per cent., the saving we will be able to effect will be considerable.

"It is simply this, that with our stores in operation the value of the policeman's dollar will rise to $1.50, and although the salary of the New York policeman is $1,900 or $2,000, the value of that amount will be equal to $3,000, which will make the New York City Police Department the highest paid department in the world.

"Of course, we must have it perfectly understood that buying for outsiders is taboo. Any man found doing this will be blacklisted and he will be unable again to make a purchase.

"According to an arrangement which we have completed with a large manufacturer of shoes, it will be possible for the Home Service Division to sell a specially made shoe which has been designed for policemen and if bought in an outside store would cost more than $20. The police store will have these shoes on sale within a short time at something like $8. We decided upon these shoes because so many of the policemen suffer from foot trouble.

"Another arrangement has been made to sell uniforms to the men. In a very short time we will have our own tailoring department, and the cloth with which to make the uniforms will be purchased directly from the producer, which will mean a great saving to the men. The men of the department have been listening to promises for some time, but now things are going to happen."

Mr. Ulman is a member of the New York Stock Exchange. At the time of his appointment recently he described a project for the establishment of a $5,000,000 hospital for the benefit of the policemen and their families. The hospital, Mr. Ulman said, was to be started at once. The wealthy special deputy police commissioners have announced their intention to subscribe to the fund, which will require $2,000,000 for the building and $3,000,000 for maintenance. Mr. Ulman said that ex-President Taft had consented to act as honorary chairman of the Police Hospital Board.

GOVERNMENT AND FINANCE

Mayor of Canton Removed by Governor.

Canton, O.—Charles E. Poorman has been ordered permanently removed as chief executive of the city. The order of removal was issued by Governor Cox after a hearing before the governor which resulted in mayor Poorman being convicted of gross neglect of duty through failure to properly maintain order during the steel strike here during September and October. Henry A. Schrantz, serving as mayor since the suspension of Poorman by Governor Cox on October 27, will continue to handle the reins of the city government until mayor-elect Herman R. Witter takes office January 1. Poorman expects to appeal the action of the governor to the courts. The appeal will be made on error, according to attorney Sweitzer, counsel for Poorman. The governor's order of removal marks the end of a turbulent term of less than two years as mayor for Poorman. Frequent clashes with council, his unsuccessful attempt to oust Charles N. Riblet as police chief, defeat by his party for renomination, the steel strike and its attendant disorder, and the final climax of suspension and removal by Governor Cox, were the high spots in the Poorman administration. Poorman had previously spent eight quiet and peaceful years as treasurer of Canton. The action of Governor Cox in following up his suspension of Poorman by an order of removal did not come as a surprise to Poorman or those present at the hearing in the governor's office. Poorman said chief Riblet had not been as active in preserving order as he might have been. Poorman said there had been no disorder in Canton since October 24, three days before he was suspended by the governor. Affidavits were presented from chief of police Riblet, Ellis Darany, sergeant of police; S. A. Lengel, lieutenant of police, and Robert F. Patterson, captain of police, in support of the mayor's contention that there had been no disorder since October 24. The policemen blamed private police for the trouble. Letters were also presented from prominent citizens, including steel company officials, asking Poorman's reinstatement. The governor made the following statement after announcing the removal of Poorman: "In times such as these, no temporizing policy can be countenanced and I feel that restoration to office might be accepted throughout the state as a relaxation of that order of vigilance that must continue. The laws must be enforced and no compromise must be made with that fixed policy. Because of this, suspension was followed by removal from office. There has been nothing in the inquiry to indicate that mayor Poorman deliberately neglected his duty, but the element of neglect was present in such measure as to render state action necessary to the public interest. Cordial relations were not existent between the mayor, the chief of police and the city council, and this circumstance seemed to have developed a sort of do nothing policy, the mayor seeming to believe that it was quite useless for him to make any attempt. In short, he did not exercise his leadership in an emergency which the community was entitled to, and seemingly possessed no conception of the power inherent in his office. As a result, a crisis developed, and the head of the municipal government did not render a proper accounting to it. It was stated in the hearing, and not denied, that conditions now are normal, but because of this appeal was made for the reinstatement of the mayor." The six charges against Poorman were said to be as follows:

1—Failure on the part of the said mayor to supervise generally the department and offices of the corporation as authorized and required by sections 4262 and 4263 of the general code, and particularly in not exercising a supervision over and requiring a strict performance of the duties of the police department of said city.

2—In permitting the peace, quietness and good order of the city to be disturbed by mobs and rioters without taking the necessary and proper steps to prevent the same.

3—In permitting citizens of said city of Canton, and particularly men who desired to work in the various manufacturing plants, to be assaulted by rioters and strikers without exhausting the powers conferred on him by law to protect the same.

4—In not taking full advantage of and exhausting the power conferred on him by section 4373 to appoint additional patrolmen and officers for temporary service during the existence of the emergency created by said riotous gatherings and other conditions arising out of the strike situation in said city.

5—In not properly protecting the property of citizens of said city of Canton in that street cars operating in said city of Canton were allowed and permitted to be stoned and damaged.

6—In not properly performing the duties of chief conservator of the peace within the corporation as prescribed by section 4250 of the general code.

City Manager Appointed.

West Palm Beach, Fla.—Joseph Firth has assumed office as city manager, having resigned from the position of commissioner of public works of Winston-Salem, N. C., to come here. He came to Winston-Salem from Charlotte, first as city engineer, being appointed commissioner of public works upon the re-organization of the city government under a revised charter. His work in Winston-Salem has been highly commended, water and sewer facilities having been extended throughout the city; streets connected up and put in passable condition, miles of streets having been put to permanent grade and many miles of street paved; concrete sidewalks have been laid all over the city; the city water system has been practically reconstructed. Plans for a dam on the water shed, which will hold in reserve 60 to 90 days reserve, will soon be ready to turn over to the city. Under his direction the department has been kept well in advance of the growing needs of the city. Mr. Firth will be succeeded in Winston-Salem by capt. Harry L. Shaner, former city manager at Lynchburg, Va., but who has been engaged in government work since he entered the services of the war department at the bginning of the war. Capt. Shaner will be assisted by W. F. B. Halensworth, of Greenville, S. C.

STREET CLEANING AND REFUSE DISPOSAL

Hog-Feeding Contract Abandoned.

Davenport, Ia.—It is costing the city $10,000 a year at present because the citizens would not refrain from throwing broken bottles, safety razor blades, and such rubbish into their garbage cans. Davenport for years has provided free garbage collection at a cost of over $20,000, before the recent annexations to the city. Something over a year ago a company offered to collect the garbage and feed

it to hogs for $12,500 a year, if the city would adopt ordinances making it the exclusive general collector, and providing that no one should mix ashes, tin cans, and other rubbish with the garbage. After extended negotiations the contract was closed, and the hog farm started west of the city, an improvement over dumping the collections on the levee or the older method of throwing them into the river where they affected Muscatine water supply. Soon after the farm began operation hogs died—six in one day because of glass or safety razor blades. As a result the company threw up its contract, and the city has since been collecting the garbage at an increased expense of $1,000 a month. The annual cost of collecting garbage efficiently in the greater Davenport since outlying territory was annexed is likely to run nearer to $30,000 than $20,000.

Car Companies Must Pay for Street Sprinkling.

Sacramento, Cal.—A report received here from Washington states that the United States Supreme Court has upheld the validity of an ordinance passed here June 19, 1913, requiring the street car companies to sprinkle their tracks, and within a reasonable distance on each side in order to lay the dust while the cars are in operation. This decision ends a long battle fought by the Pacific Gas and Electric Company. The city of Sacramento won in the police, superior, appellate and state supreme courts, and finally in the highest tribunal in the land. Commissioner of streets, D. W. Carmichael, expects the Pacific Gas and Electric Company will at once pay to the city the money that is due. The damages alone amounted to about $30,000 in 1915, and Carmichael stated it will be a great deal more now. These damages have accrued by the terms of the ordinance which stated that for every day's violation the sum of $2 per mile of unsprinkled track will be paid to the city. In addition to the damages, the company will be required to pay the $400 fine which was assessed upon it in the police court. It was from the ruling of the police court that the appeal was taken. The ordinance in question was introduced by commissioner Charles Bliss at a time when the cars were operating over a very large mileage of unimproved streets. The company was willing to sprinkle that section of the street between the tracks, but refused to sprinkle on each side of the tracks for a sufficient distance to settle the dust. During the six years which this suit has been pending the city has been sprinkling the disputed area in the sections where the streets are unimproved.

City Not Restrained from Feeding Garbage to Pigs.

Baltimore, Md.—The court of appeals of Maryland has refused to restrain the city of Baltimore from disposing of garbage on a farm owned by the city and situated outside of Baltimore. (Mayor and City Council of Baltimore et al v. Sackett et al, 107 Atl., 557.) A temporary reduction plant to dispose of the garbage was to be erected by the city, and later a permanent piggery was to be established and the garbage fed to some 15,000 pigs to be kept thereon. Adjoining property owners brought suit, contending that this would result in a nuisance and destroy the value of their property. The court of appeals decided in favor of the city and refused to issue an injunction, holding that sufficient facts had not been stated to satisfy the court that the apprehension was well founded so as to justify the court's interference.

TRAFFIC AND TRANSPORTATION

Cars Resume Operation in Toledo.

Toledo, O.—After nearly a month without street car service, the city is again enjoying its electric railway system, an agreement having been finally arrived at between the factions which caused the trouble. Service was resumed at the rate of fare prevailing before the cars were taken over the state line to Michigan—six cents with two cents for transfer. Under the terms of the settlement the city and company must agree on a franchise draft by Jan. 15 or service may again be suspended after ten days. A special election is to be held on this franchise, and on a municipal ownership proposition if the city wishes, by Feb. 17, or else the company may again withdraw service. Federal Judge Killits has appointed a commission consisting of two divisions to assist city officials in drafting both the "Tayler plan" and municipal ownership ordinances. The company's requests, granted by the court, and inserted in the formal order for resumption of operation, provide:

City and Rail-Light negotiators must agree upon the draft of a service-at-cost-plus franchise ordinance not later than Jan. 15, 1920. If no such agreement has then been reached, the company can discontinue service 10 days thereafter.

A special election on the granting of the franchise ordinance must be held not later than Feb. 17. If no such election is called by council, the company can discontinue service and remove its ars and equipment within 10 days.

The fare rate is to be six cents, with two cents for a transfer—the same rate which prevailed before the cars were taken to Michigan—but the company is granted the right to appeal to the court for revision of fares. There can be no arbitratory raises, such as that which precipitated the passing of the ouster ordinance by council last June.

The company reserves the right to rearrange its schedules to meet motor bus competition, if it continues.

The company reserves the right to apply to the court for permission to discontinue service if the city, in its dealings, seeks to impose unfair or confiscatory burdens upon the company.

The company disclaims, specifically, its recognition as legal, either of the original ouster ordinance or the Duffey amendment.

Although the court order makes no reference to the possible or probable submission to the voters of a municipal ownership ordinance, Judge Killits, Mayor Schreiber and company representatives agree that this is to be done. The city council had previously voted to "amend" the ordinance which originally ousted the car company providing for a return of service at the six cent fare, with two cents for transfer.

"Service-at-Cost" Franchise Defeated.

Minneapolis, Minn.—The proposed "cost of service" franchise giving the city control of street car service was defeated at the special election recently. The majority against was nearly 7,000.

Massachusetts to Buy Transit Tunnel.

Boston, Mass.—The state house of representatives has passed a bill providing for the purchase by the state of the Cambridge subway. The bill provides that the state shall pay to the "Elevated" not more than $8,000,000 for the property, and lease it to the company for a rental equivalent to 4½ per cent. on the bonds to be issued by the State on account of the purchase price. This $8,000,000 is to be used by the "Elevated" for the purchase of new rolling stock and other equipment, which, according to the trustees, could not otherwise be obtained. The "Elevated," in addition to this new capital, will benefit by the difference between the comparatively low rate of interest it will pay as rental and the high rate which it would be obliged to pay on such bonds or stocks it might later be able to issue to obtain the $8,000,000 new capital necessary to maintain its property.

First Zone Fare Plan in California.

San Diego, Cal.—Authorization of a zone system of fares for the electric street railways of San Diego has been decided on by the State Railroad Commission, the decision being the first on record in which the one-fare system for street railways have been departed from in California. The decision lays down several new precedents for the operation of street car lines in the state. The opinion was written by Commissioner Frank R. Devlin, following an examination by himself and commission enginers into the affairs of the San Diego Electric Railway Company and Point Loma Company, which had applied for relief from financial troubles through higher fares and permission to abandon specified lines. The decision authorizes an inner, or short-haul zone in which fares shall be 5 cents and an outer, or long-haul, zone, fares to be 10 cents. Interurban fares are readjusted. Ticket books—four tickets at 7½ cents and sixty-ride books at 6½ cents—are ordered. Application of the street railway company to discontinue lines in East San Diego and Point Loma is denied, and radical changes in paving laws are recommended to the San

Diego municipal government to obviate the necessity for expensive types of paving work by the street car company. The decision is based on investigations extending over a year's time, following the company's appeal for higher fares. Devlin's report says that the zone fare system is estimated to give the company sufficient income, even taking into consideration a possible dropping off of traffic under the higher rates. The company is ordered to set aside a depreciation fund of $18,000 a month out of its increased income.

City Told to Take Over Street Car Lines.

Walla Walla, Wash.—The state public service commission, after an informal hearing which lasted two days, has recommended that the city lease the street car lines of the Walla Walla Street Railway company and run them until such time as a final solution of the problem of keeping the cars in operation could be decided upon. The annual deficit at present is about $12,000, and it is thought that with municipal ownership and physical connection with the O.-W. R. R. & N. railway, that freight and other earnings can be materially increased. It is understood that the city commissioners have power to lease the lines and operate them without change in the city charter.

MISCELLANEOUS

City Planning Expert Appointed.

Spokane, Wash.—Agreement to employ a city planning expert for this city at a salary of $3,600 a year has been reached by the city plan commission. C. S. Cheney of San Francisco, city plan consultant for Portland for the last two years, has been agreed upon

Ordinance to Prevent Rent Profiteering.

New York, N. Y.—An ordinance which, says the chairman of the Mayor's Committee on Rent Profiteering, will be effective in breaking up the "rings of lessees who have conspired to bleed tenants already paying abnormal rents" has been passed by the board of aldermen. The new measure provides for the licensing of all lessees. The Mayor's Committee believes the lessees are responsible for a large part of the profiteering in rents, the favorite being to lease and sublease and resublease among the various members of a family, each new transaction being accompanied by another rise in rent. The ordinance, stripped of its technical provisions, is as follows:

A person, corporation, or partnership who or which leases a tenement in the City of New York having three or more dwelling apartments and subleases any portion or part of the said tenement to three or more persons shall be deemed to be a lessee of tenements intended within the terms of this ordinance.

The Commissioner of Licenses, with the approval of the Tenement House Commissioner of the City of New York, shall license, in his discretion, such lessees of tenements as shall have complied with the rules and regulations laid down by the Board of Aldermen, and, further, any such rules and regulations to be subject at all times to amendment by the Board of Aldermen. The annual license fee for such tenement leases shall be $25, and $10 additional for each additional tenement the said lessee may lease.

Each tenement lessee in the City of New York shall on or before Jan. 1 of each year procure a license in accordance with the provisions heretofore stated.

The Commissioner of Licenses, after hearing, shall have power to suspend or revoke at any time any license granted in accordance with this article. Any person, firm or corporation whose license has been revoked shall be ineligible to procure a new license for at least three years from the date of the revocation of said license by the Commissioner.

The purpose and effect of the measure, as explained by chairman Hirsch, is as follows: "It has a two-fold purpose. First, it will enable those who are affected by the gouging of rent profiteers to determine who is the owner of the property and how often the leased premises have been transferred with the sole purpose each time of bleeding the tenants after they have already been bled white. In the second place, it will act as a deterrent to the leasing of premises among relations or friends when such transfer has behind it no other intent than to provide an excuse for the raising of the rent. With the help of the new ordinance we shall be able to establish a conspiracy among relatives and friends, and will prevent such conspiracies from being entered into. Heretofore, while it has been necessary to record actual transfers of property, the recording of a lease has been optional with the lessee, and it is from the lessees or the leasters, as the tenants call them, that we have had the most trouble."

LEGAL NOTES

A Summary and Notes of Recent Decisions—Rulings of Interest to Municipalities

State and City Regulation of Automobiles.

(Cal.) Motor Vehicle Act 1913, requiring automobile drivers when passing street cars in a city to operate the automobile with due care and caution to prevent injury to those boarding or alighting from the car, and a city ordinance requiring an automobile driver to stop 10 feet behind a car standing still to allow passengers to board or alight, are not inconsistent.—Mann v. Scott, 182 p. 281.

Where the Legislature has assumed to regulate a given course of conduct by prohibitory enactments, a municipality with subordinate power to act in the matter may make such new and additional regulations in aid and furtherance of the purpose of the general law as may seem fit and appropriate to the necessities of the particular locality, and which are not in themselves unreasonable.—Id.

County Road in City Limits—City Without Control.

(Or.) Although a county road may traverse land within the limits of an incorporated city or town, yet, unless the state through its legislative department, or the county as the agent of the state, employing procedure prescribed by statute, surrenders authority over the road, the city cannot assume control.—Cole v. City of Seaside, 182 p. 165.

The mere fact that the county road is embraced within the boundaries of a recently created municipality does not ipso facto make it a city street.—Id.

Damage to Bull Falling Into Sewer Excavation—Negligence of City.

(Iowa). Where plaintiff's bull, which was being driven along the street of a municipality, stepped on a scraper and fell into an excavation for a sewer which had been left open and unguarded, held, that the negligence of the municipality was the proximate cause of the injury.—Johnson v. City of Denison, 173 N. W. 46.

(Iowa.) Where there was testimony that plaintiff's bull was proceeding leisurely along the street in a quiet and orderly manner when he fell into an open excavation, plaintiff cannot be deemed guilty of contributory negligence under Code, § 2314, declaring that stock shall not be considered as running at large so long as it is under the immediate care and efficient control of the owner upon public roads for travel; but the question was for the jury.—Id.

Power of City to Regulate Business—Size of Restaurant Booths.

(Utah.) An ordinance regulating a business must be reasonable, and its provisions cannot be oppressive nor an arbitrary interference with the business or calling which is regulated.—Ogden City v. Leo. 182 p. 530.

The power of a city to "regulate" a particular calling or business as conferred by statute (Comp. Laws 1917, § 570x 38) implies the right to prescribe and enforce all such proper and reasonable rules and regulations as may be deemed necessary and wholesome in conducting such business in a proper and orderly manner.—Id.

Where there is nothing on the face of an ordinance regulating the size of booths in restaurants to show it is unreasonable, that it is unwarranted interference with a proper business, or that the conditions in the city are not such as to require regulation, it will be presumed that the city authorities were warranted in passing the ordinance.—Id.

NEWS OF THE SOCIETIES

Feb. 9-13, 1920.—AMERICAN ROAD BUILDERS' ASSOCIATION. Annual convention, Louisville, Ky. Secretary, E. L. Powers, 150 Nassau street, New York.

May 18-21, 1920.—NATIONAL ELECTRIC LIGHT ASSOCIATION. Annual convention, Pasadena, Cal. Acting secretary, S. A. Sewall, 29 West 39th street, New York City.

June 21-25, 1920.—AMERICAN WATER WORKS ASSOCIATION. Annual meeting, Montreal, Canada. Secretary, John M. Diven, 153 West 71 street, New York City.

Jan. 14, 1920. — NEW ENGLAND WATER WORKS ASSOCIATION. Annual meeting, Hotel Brunswick, Boston, Mass. Secretary, Willard Kent, Narragansett Pier, R. I.

Jan. 19, 1920.—AMERICAN INSTITUTE OF CONSULTING ENGINEERS. Annual meeting, New York City. Secretary, F. A. Molitor, 35 Nassau street, New York City.

National Highway Traffic Association.

The annual convention of the National Highway Traffic Association wil be held in the International Amphitheatre, Chicago, on Thursday, January 29. The following program will be presented at the morning session. Arthur H. Blanchard, president, National Highway Traffic Association, acting as chairman:

Report of committee on "Highway Transport Franchises," chairman, F. W. Fenn, secretary, Motor Truck Committee, National Automobile Chamber of Commerce.

Report of committee on "Inter-relationship of Highway, Railway and Waterway Transport," chairman, Professor Henry E. Riggs, University of Michigan.

"Effect of Car Tracks on Traffic Capacity of Roadways" by George W. Tillson, consulting engineer, La Grange, Ill.

Report of committee on "Traffic Limitation Strips on Roadway Surfaces," chairman, C. W. Hubbell, city engineer, Detroit, Mich.

Report of committee on "Sign Posting for Detours, and Through Routes in Municipalities," chairman, Elmer Thompson, secretary, Automobile Club of America.

On Thursday afternoon, at 2:30 p. m., will be held a joint session of Highway Transport Conference of the National Highway Traffic Association, on the subject of "Highways and Motor Transport." The chairman of session wil be Arthur H. Blanchard, president. The following papers will be presented:

"Taking an Interest in Motor Truck Legislation by Harry Meixwell, Jr., secretary, Automotive Industries Legislative Commission, New York.

"Value of Highway Transport Surveys," by F. Van Z. Lane, transportation engineer, Packard Motor Car Company.

"Inter-relationship Between Highway Transport and Back-to-the-Farm Movement," by R. C. Hargreaves, manager Detroit branch, B. F. Goodrich Rubber Company.

Another joint session will be held in the evening, the subject being "Highways and Motor Transport." The chairman of the session will be R. C. Hargreaves, vice-president, North Central Division, National Highway Traffic Association. The following papers will be read:

"Relation of Highways to Motor Truck Operating Cost," by Arthur H. Blanchard, Professor in Charge of Highway Engineering and Highway Transport, University of Michigan.

"Progress in Highway Improvement," by William G. Edens, president, Illinois Highway Improvement Association.

"Constructing Roads for Motor Truck Traffic," by T. R. Agg, Professor of Highway Engineering, Iowa State College.

"Status of Legislation Relative to Snow Removal from Inter and Intrastate Highways," by Raymond Beck, chief, Goodrich National Touring Bureau.

The Associated General Contractors of America.

Secretary G. W. Buchholz of the Associated General Contractors of America has sent the following letter to associations of manufacturers of construction equipment and materials protesting against the practice of supplying engineers and contractors with detailed estimates of costs:

"You are anxious to push highway construction, of course; the more miles of road let at fair prices next year, the better pleased you will be. For this reason, if for no other, I am sure I can count on your aid in removing one big hindrance to placing large quantities of work under contract, and upon your assistance in attracting high grade contractors to highway work.

"Our members who build roads in a big way tell us that they are handicapped in securing profitable work—and others who might enter the highway field stay out—**because of the low estimates that** frequently have limited the prices at which contracts could be awarded, and because of the precedents established by ill-advised bidders.

"These highway contractors feel that the low cost figures spread abroad by various machinery manufacturers are to a large degree responsible for many of these low estimates, particularly when costs based on an exceptional performance are incorporated into a detailed estimate for another very dissimilar job, and overhead and contingencies are not properly cared for. We realize that no intentional misrepresentations are made, but figures that cause a lot of trouble are sometimes given to an inexperienced engineer or contractor who has not the judgment to use them properly.

"In our opinion, equipment and material representatives should refrain entirely from supplying an engineer or contractor with detailed estimates of cost. Perhaps he isn't as competent as your man to determine the theoretical cost of mixing and placing concrete or the proper allowance for overhead, but experience is a good teacher and the best cure for incompetency.

"Certainly if the estimate is too low, tell him what other similar work has gone for. Tell him about your equipment and what you think it will do—then let him reduce the data to his conditions.

"Naturally you will work enthusiastically for your own interests—everyone expects it and the work you are doing for a big good roads program is much appreciated. But we request that you do not endanger our interests by invading the field of the engineer or the contractor.

"We hope for you cooperation in this matter, both as regards your own men, and in urging the same policy upon other manufacturers. We should be glad to receive your opinions for publication."

A member of the A. G. C. recently sent the following leter to an equipment manufacturer:

"We have your recent letter requesting a statement of costs of hauling with your wagons.

"We have a very strong prejudice against manufacturers publishing so-called 'costs' of handling material with their equipment, and in particular the preparation of detailed estimates, and you will note at the present time there is agitation by the Associated General Contractors to endeavor to persuade firms to stop this practice, as it has a tendency to encourage people to enter the contracting business that have a few dollars but little sense.

"Daily costs are kept on our work, and we could send you a very beautiful statement, which would be based upon facts, but there are no two days alike and in order to get a statement of any value you would have to take an average over a period of months. Take for instance your statement of costs in your folder. You show a yard mile cost of 23.4 cents. If this could be done all the road contractors in this country would be immensely wealthy instead of nearly all of them being 'broke.' Your loading cost of 15 cents a yard would be a joke if it wasn't serious.

"Your wagons are proving entirely satisfactory so far as we have used them. But there is one thing further we would like to call your attention to, and that is your referring to your wagons as 3½-yard. This is a hindrance to contractors, as the wagons, loaded the way we load them, hold four yards, and we expect an estimate on that basis. An engineer sees your catalog showing only 3½ yards and an argument is started. We do not want you to feel that we are selfish in this business, but we perhaps are one of the oldest in the game and we have seen a great many rise and fall through ignorance of actual conditions."

American Association of Engineers.

The latest member obtained by the American Association of Engineers in its campaign for 10,000 new members during the first two weeks in December is Major General Leonard Wood, commanding general of the Central Department of the United States Army.

General Wood's application was passed by the national qualifications committee of the Association on account of the engineering experience obtained by General Wood while he was military governor of Mindanao and because of the high order of sanitary engineering talent displayed by him while acting in that capacity. General Wood was in charge of the construction of highways, harbor improvements, railroads, schools, water purification works, and sewerage systems.

General Wood is the ten-thousandth member of the American Association of Engineers. A year ago the membership was only 2,300 and this increase to 10,000 is irrespective of the members gained during the drive throughout the United States from December 1 to 13.

Board bill No. 56 providing for increased compensation for profesional

(*Continued on page 360*)

NEW APPLIANCES

Describing New Machinery, Apparatus, Materials and Methods and Recent Interesting Installations.

ROTARY PUMP.

For Attachment to Ford Chassis for Fire-Fighting and Other Purposes.

A small rotary pump which can easily and quickly be mounted on a Ford touring car chassis has been designed to bring a motor-driven pumping engine within reach of even the smallest communities. The pump is so compact and so efficient for its size as to make it a versatile piece of equipment, suitable for pumping water from ditches during construction work, for pumping out manholes, flushing out sewers, spraying trees, etc., as well as for fire-fighting.

The pump is of the rotary type with phosphor bronze rotors, alloy steel shafts, annular ball bearings, patented bronze stuffing boxes.

The drive unit consists of an oil-tight case carrying nickel steel hardened gears on annular ball bearings. The sliding gear is operated by a lever, which is on the outside of case convenient to the driver. This drive unit case is bolted to the pump head in such a manner that it is practically part of the pump.

Each pump is equipped with two suction hose and two discharge hose connections, one of each on each side of car. The discharge connections are fitted with shut-off valves, while the suction connections are supplied with removable brass caps. There is a by-pass (hand operated) between the discharge and the suction tubes of the pump.

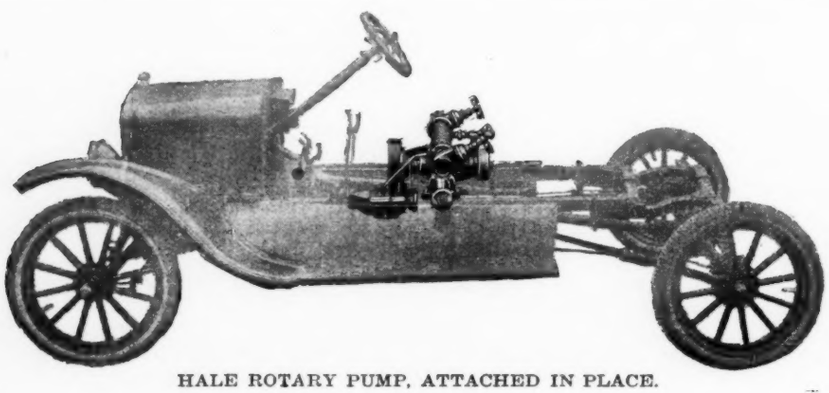
A pressure gauge is supplied with each pump, together with the necessary tubing and fittings. Suction hose and strainer are supplied if ordered. Strainers are of heavy brass, perforated.

In mounting, the drive shaft and housing are detached, the pump is placed in position on the frame and the front end of the drive unit bolted to the rear of the transmission housing. The propeller shaft is connected to the rear end of the drive unit. A one-quarter inch copper tube is run from a fitting which is on the pump to the cylinder block of the motor.

A gear shift lever is attached to the drive unit, permitting the operator to disengage drive shaft of car and engage the pump by throwing out the clutch and moving the lever forward or backward.

Any man who can satisfactorily operate a Ford car can handle this pumping engine without difficulty and obtain results at a fire or in any other service possible.

The pump, shown in the accompanying illustration, is made by the Hale Fire Pump Co., Inc.



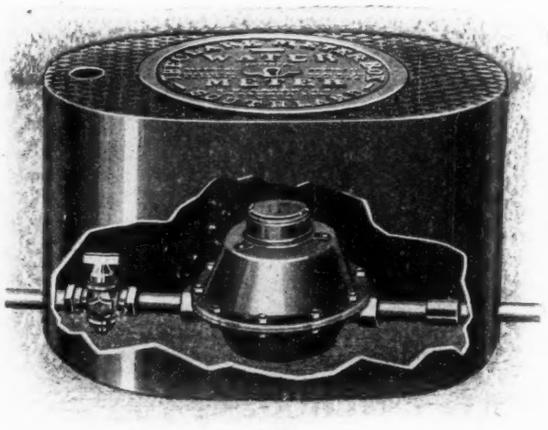
HALE ROTARY PUMP, ATTACHED IN PLACE.

CLARK METER BOX.

With New Combination Feature.

The "No. 11 Oval Southland" Clark meter box has a number of interesting features which are in many ways a departure from ordinary practice in meter box construction. These are calculated to result in a saving in installation, maintenance and reading.

An unusual combination feature is the housing of the curb cock in the same box with the water meter, in this way eliminating the use and expense of the separate curb cock and thus making a substantial saving.



NO. 11 OVAL "SOUTHLAND" CLARK METER BOX.

While the box offers the plumber quick and convenient access to the curb cock, the meter can be reached only with the use of the key required to operate the "Wonder" lock of the box lid.

This meter box is so constructed that it can be readily removed from the concrete walk or pavement without in any way damaging or defacing the concrete. This is of particular advantage because leaks located back under the walk or pavement may be repaired working from the box. The box is removed by unlocking the lid and lifting the box straight up and the necessary tunneling may be done for several feet on either side—the box then being replaced through the original opening for its setting.

The box presents a neat appearance in the lawn or sidewalk and is safe to pedestrians while it assures meter protection. It is furnished in cast iron and sheet iron, black and galvanized. The accompanying illustration shows a cast iron box with a part cut away to show the interior features.

This box is made by H. W. Clark Company, Mattoon, Ill.

INDUSTRIAL NEWS

Important Consolidation in Construction Materials and Equipment Field.

The firms of Waldo Brothers, Inc., dealers in building materials, and Harold L. Bond Co., dealers in construction equipment, have been consolidated into a new firm, Waldo Bros.

and Bond Company, effective Jan. 1, 1920.

The board of directors of the new firm will be as follows: Harold L. Bond, president; C. Sidney Waldo, first vice-president; Llewellyn Howland, vice-president; Harold C. Bond, secretary; Frederic W. Mattheis, sales manager; James G. Lincoln, treasurer; Roger Ernst and Frank M. Bates. The offices and salesroom will be at 181 Congress street, Boston, Mass., and it is expected that the consolidation will afford a complete service to the contracting and building industry of New England.

Highway Transportation Conferences at Automobile Shows.

All truck owners are invited to attend the highway transportation conferences to be held in connection with the New York Automobile Show, January 3-10 and the Chicago Automobile Show, January 24-31.

Twice daily for an hour and a quarter, with the exception of the opening and closing day at the New York and Chicago shows there will be discussion of every type of truck problem. The sessions afternoons and evenings will be devoted to different phases of transportation appealing to different types of users of trucks, but all sessions will be open to all who wish to come.

A feature of the conference sessions will be the liberal use of illustrations, both steropticon slides and motion picture films. An added feature will be motion picture shows, lasting one-half hour or more, and following the sessions, each afternoon and evening. For these "movies" a large number of films, dealing with motor transportation in all of its varied phases, are being collected. Several are being secured from abroad. Dr. Francis Holley, Director of the Bureau of Commercial Economics at Washington, is co-operating in collecting interesting films having to do with highway transportation by motor vehicles.

The conference will open on the evening of Jan. 3 in New York and the evening of Jan. 24 in Chicago, with important inaugural sessions. Invitations to speak at these inaugural sessions have been extended to members of the President's cabinent, United States senators and governors of different states, and already several have accepted.

There is a general title for each session and two or three sub-divisions, each with its own subjects.

The following will be the subjects discussed at the afternoon sessions, the earlier date referring to New York and the later to Chicago:

Jan. 5, Jan. 26.
Merchandising Motor Trucks.
Effective Advertising.
The Trade Segregation Plan.
The Farm Field.

Jan. 6.
Smoothing the Path of the Motor Truck.
Working for Highway Improvement.
Taking an Interest in Legislation.
The Automobile Legislative Council.

Jan. 7, Jan. 28.
Selling on the Firing Line.
Proven Sales Plans.
Developing Prospects.
Promoting Rural Motor Express and Other Enterprises.

Jan. 8, Jan. 30.
In the Matter of Service.
The Truck Owner's Viewpoint.
The Truck Dealer's Plan.
The Manufacturer's Policy.

Jan. 9, Jan. 27.
Selling Motor Transportation.
Handling Motor Trucks and Passenger Cars Together.
Offering a Complete Transportation Line.

Jan. 29.
(This session is under the direction of the National Highways Traffic Association.)
Promotion of Highways and Traffic.
Taking an Interest in Legislation.

The following will be the subjects of the evening sessions:

Jan. 5.
Motor Vehicles in Passenger Transportation.
Replacing Street Cars with Motor Buses.
Motorbus Operation.

Jan. 6, Jan. 30.
Increasing Motor Haulage Efficiency.
Cost Accounting, Routing and Dispatching.
Loading and Unloading Devices.
Incentive for Drivers and Helpers.

Jan. 7, Jan. 28.
Rural Motor Express.
Its Opportunities as an Investment and Business Career.
Its Advantages to the Shipper.
Its Benefits to the Producer and Consumer.

Jan. 8, Jan. 31.
Aids to Motor Truck Efficiency.
Trailers.
Pneumatic Tires.

Jan. 9, Jan. 26.
Motor Truck and Railroad Freighting.
Cost, Range and Service Comparisons.
Connecting Farms and Markets.

Jan. 10, Jan. 29.
Highways and Motor Transport.
Relation of Roads to Operating Cost.
Progress in Highway Improvement.
Constructing Roads for Motor Truck Traffic.

Jan. 27.
The Farmers' Haulage Problems.
The Horseless Farm.
Connecting Farms and Market.
Farm Power.

Plan Municipal Equipment Exposition in Europe.

Mrs. Jeanne Carpenter, until recently director of the projected International Exposition of Municipal Equipment, now plans to work out a somewhat similar exposition in Europe. This new plan has no connection whatever with the other or with the Merchants and Manufacturers Exchange of New York. Associated with Mrs. Carpenter will be E. J. Dewine, who was also connected with the abandoned exhibition in Grand Central Palace.

Prominent Engineers Inspect Concrete Culvert Pipe Tests.

An inspection trip was recently made by prominent railway and highway engineers to Ames, Iowa, to witness experiments being made by the Experiment Station of Iowa State College, in conjunction with the Iowa State Highway Commission. Experiments cover tests on reinforced concrete culvert pipe, special concrete culvert sections, and studies of soil loadings on culvert pipe as a basis for certain standardizations contemplated in design.

The trip was considered an unofficial sub-committee meeting of the Joint Concrete Culvert Pipe Commitee, an organization which has come into existence this year by appointment of representatives by a number of the technical societies for co-operative study of culvert pipe specifications. During the year, a number of societies have appointed two members each on the Joint Committee, under the chairmanship of H. T. Shelley, assistant engineer of sewer construction, department of public works, Philadelphia.

The organizations with their representatives are as follows:

American Concrete Institute.—B. S. Pease, American Steel & Wire Co., 208 South LaSalle street, Chicago; A. B. Cohen, Delaware, Lackawanna & Western R. R., Hoboken, N. J.

American Association of State Highway Officials.—T. R. Agg, Iowa State College, Ames, Iowa; J. N. Mackall, Maryland State Roads Commission, Garret Bldg., Baltimore, Md.

American Railway Engineering Association.—Job Tuthill, chief engineer, Pere Marquette Ry., Detroit, Mich.; A. F. Robinson, bridge engineer, Atchison, Topeka & Santa Fe, Railway Exchange Bldg., Chicago.

American Society for Testing Materials.—H. T. Shelley, assistant engineer, sewer construction, department of public works, 416 City Hall, Philadelphia, Pa.; A. E. Phillips, sanitary engineer, 2115 Bancroft place, Washington, D. C.

American Society of Civil Engineers.—Geo. H. Tinker, bridge engineer, N. Y. C. & St. L., 516 Columbia Bldg., Cleveland, Ohio; T. L. D. Hadwen, engineer of masonry construction, C. M. & St. P., Railway Exchange Bldg., Chicago.

American Concrete Pipe Association.—Paul Kircher, Massey Concrete Products Corp., 50 Church street, N. Y. C.; C. F. Buente, Concrete Products Co. of America, Diamond Bank Bldg., Pittsburgh, Pa.

Office of Public Roads.—T. H. MacDonald, director, Office of Public Roads, Dept. of Agric., Washington, D. C.; A. T. Goldbeck, Office of Public Roads, Dept. of Agric., Washington, D. C.

There are four sub-committees as follows: No. 1, Classifications and Loading Requirements.—T. R. Agg, chairman, B. S. Pease and Job Tuthill; No. 2, Design.—Job Tuthill, chairman; No. 3, Methods and Requirements of Tests.—A. E. Phillips, chairman; No. 4, Workmanship and Installation.— A. B. Cohen, chairman. Personnel of the last three has not yet been completed.

Sub-Committee on Classifications and Loading Requirements is the subcommittee primarily concerned with the loading and breaking test now being conducted at Ames, which will furnish basis for standardization in the design of pipe for both railway and highway purposes.

An important feature in the organi-

zation of this committee is the fact that the associations and societies represent not only the consuming and producing interests but also the neutral technical societies such as the American Society of Civil Engineers and the American Society for Testing Materials. The result of the work of this committee should be a thorough understanding of the elements involved in design and perhaps a certain amount of standardization in the details of manufacture will be possible if mutually agreeable to manufacturers and users.

A thorough understanding of this problem and the use of standard specifications by the highway departments of various states and bridge and building departments of various railroads, so far as this is possible, will result in eliminating unnecessary expense in some cases and providing adequate strength in others.

Those attending the meeting at Ames were as follows: T. R. Agg, Job Tuthill, A. F. Robinson, G. H. Tinker, C. F. Buente, J. E. Moody, M. W. Loving, J. L. Zeidler, C. H. Wilson, G. E. Warren, secretary, V. E. Sladek, representing B. S. Pease..

Dean Marston of Iowa State College extended the party a cordial welcome and discussed the problems of culvert pipe specifications.

Tire Company Builds Dormitory for Employees.

To help relieve the serious housing conditions existing in Akron, Ohio, caused by the wonderful growth of the city, **The Goodyear Tire & Rubber Company** announces that a $200,000 girls' dormitory will be erected immediately. This dormitory will accommodate 175 girls and is designed for use by the many girls that are constantly coming to Akron to take positions with the company. The building is to be a three story brick structure, situated in the Goodyear Heights community near the factory. The management of the dormitory will be vested in the social service department of which Miss Clara E. Bingham is manager. The project will be operated on a cost basis as there is no desire on the part of the company to profit from its operation. The girls will pay for their accommodations at actual cost to the company.

NEWS OF THE SOCIETIES

(*Continued from page 357*)

engineers employed by the city of St. Louis has been passed by the board of aldermen of that city. This bill was prepared by the municipal section of the St. Louis Chapter of the American Association of Engineers last spring, and its passage is the culmination of a campaign which has been waged since to have it enacted into law.

The bill had previously been endorsed by a number of engineers and employes as containing provision for reasonable increases in salaries, and had been endorsed by the efficiency board. The board of estimate and opportionment was the stumbling block which prevented the progress of the bill up to the board of aldermen for passage, and the fact that it has now approved the bill means that the increased salaries will go into effect January 1st.

The success of the municipal section of the St. Louis Chapter of A. A. E. in obtaining these results is largely due to the efforts of Ernest Paffrath and George Grimm, Jr., respectively president and secretary of the section.

Following a recent hearing granted to the engineer employes of the city of Cleveland before the Board of Control of that city, the latter body authorized an increase of 10 per cent in salaries of professional engineers employed by the city.

PERSONALS

Marble, Arthur C., who has served the city of Lawrence, Mass., continuously since 1875, has resigned as city engineer, retiring to private life. Robert W. Priestman, first assistant to Mr. Marble for a number of years, has been named city engineer.

Stanley, Capt. William E., Engineers, U. S. A., who recently returned from 20 months' service in France, has received his discharge and has accepted a position with Pearse & Greeley, consulting sanitary and hydraulic engineers, Chicago. Mr. Stanley will be resident engineer on the construction of a sewer system for South Charleston, W. Va.

Wigley, C. G., formerly chief engineer of the New Jersey State Department of Health, is now employed as engineer with Clyde Potts, 30 Church street, New York City.

Wiley, Rodman, formerly state highway commissioner of Kentucky, has recently become chief engineer of the Kentucky Rock Asphalt Co. Previous to becoming highway commissioner, Mr. Wiley was bridge engineer of the Department of Public Roads of Kentucky. He became an associate member of the American Society of Civil Engineers in 1914.

Kennedy, Cornelius, veteran West Virginia street paving contractor, died at his home in Parkersburg, W. Va., Dec. 7, at the age of 83. Mr. Kennedy entered the paving business in the early 80's and constructed the first brick pavements in many cities in West Virginia, Ohio and western Maryland. He took an active part in construction work until a few months before his death, being the senior member of C. Kennedy & Son. Recently Mr. Kennedy disposed of his interests to the Kennedy Construction Co., of which his son, John R. Kennedy, who has been associated with him since boyhood, is president and general manager.

UNITED STATES CIVIL SERVICE EXAMINATION.

Fire-Prevention Engineer
January 13, 1920.

The United States Civil Service Commission announces an open competive examination for fire-prevention engineer. Vacancies under the Quartermaster General, War Department, office of the Director of Purchase and Storage, for duty throughout the United States, at $2,500 to $4,000 a year, will be filled from this examination.

Both men and women, if qualified, may enter this examination, but appointing officers have the legal right to specify the sex desired in requesting certification of eligibles. For positions in the office of the Director of Purchase and Storage male eligibles are desired.

The principal duties of appointees will be the conducting of investigations leading to improvements in fire-prevention installations, equipment, and devices, and to make suitable recommendations. These duties are such that appointees should be familiar with building construction in general and with drawings and specifications; with the installation, use, and relative advantage of fireproof building materials; have general knowledge of water-supply systems, and be familiar with the installation, use, and relative merit of fire-prevention equipment and devices; and they should be able to determine the presence of existing fire hazards and to make specific recommendations regarding same. They must be able to conduct tests of fire-prevention and fire-fighting equipments and to make intelligent reports.

Competitors will not be required to report for examination at any place, but will be rated on the following subjects, which will have the relative weights indicated:

Subjects	Weights
1. Physical ability	10
2. Training and experience	90
Total	100

The prerequisites for consideration for this position are graduation from a four years' high school course or equivalent education, and three years of responsible experience in making or supervising fire-prevention inspections and installing fire-prevention methods in Government storage houses, military posts or other Government plants, or in large commercial or manufacturing plants. The completion of each year of an engineering coure in a college or university of recognized standing will be accepted as equivalent to six months of the required experience. For each year lacking of the high-school course an additional year of the required experience will be accepted.

Applicants should at once apply for Form 1312, stating the title of the examination desired, to the Civil Service Commission, Washington, D. C.

ADVANCE CONTRACT NEWS

ADVANCE INFORMATION
BIDS ASKED FOR

CONTRACTS AWARDED
ITEMIZED PRICES

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BIDS ASKED FOR

STREETS AND ROADS.

Ariz., Florence. **2 p.m., Jan. 12**
Hwy. from Oracle to Mammouth in Pinal Co., 12 mi., involving 80,000 cu. yd. excav. and 600 yd. concr.—Hwy. Engr., Co. Hwy. Comn.

Ariz., Florence. **10 a.m., Jan. 13**
30 mi. light grading between Florence and Casa Grande in Pinal Co., involving 100,000 cu. yd. light earth, 900 cu. yd. concr., etc.—Hwy. Engr., Co. Hwy. Comn.

Cal., Fresno. **Jan. 9.**
Improving 12 mi. street, involving 21,550 cu. yd. earth excav., 15,670 cu. yd. concrete paving, 1,014,014 sq. ft. wearing top and 14 concrete and corrugated iron culverts; 5.35 mi. street, involving 8,260 cu. yd. earth excav., 7,005 cu. yd. concrete paving, 453,782 sq. ft. wearing top, and 4 concrete and corrugated iron culverts (concrete base with Warrenite or Jennsenite surface or asphaltic concrete base with Warrenite or Topeka surface)—Fresno Co. Bd. Supervrs.

Cal., Fresno. **Jan. 13**
Paving 10½ mi. road concr. and asphalt or patent surface in Fresno Co.—D. M. Barnwell, Co. Clk.

Fla., Bunnell. **Jan. 12**
Hard surfacing with ojus rock, coquina rock, or periwinkle shell, 26 mi. road in Shell Bluff special road dist. in Flagler Co.—S. C. Stattings, Engr.

Fla., Tallahassee. **10 a.m., Jan. 14**
Drainane, grading and hard surfacing 54.2 mi. state road in Duval, Nassau, Baker and Columbia Cos., involving 506,743 cu. yd. excav.; 285,966 sq. yd. brick or concr. paving, or 508,382 sq. yd. bituminous macadam; 216,616 sq. yd. rock shoulders; 571,930 lin. ft. concr. curb; 2,500 cu. yd. concr. and 125,000 lbs. reinforcement in drainage structures.—C. A. Browne, State Hwy. Engr.

Ga., Valdesta. **Jan. 16**
4.86 mi. hwy. from Valdosta to Mineola in Lowndes Co., 16 ft. wide, involving 45,940 sq. yd. paving, 8,549 yd. excav., etc.—Glyce & Hackley, Engrs., Nashville, Tenn.

Ind., Princeton. **11 a. am., Jan. 15.**
15,733 ft. stone and gravel road in Montgomery Twp.; stone and gravel roads in Johnson, Columbia, Union and Montgomery Twps.; 11,733 ft. stone and gravel road in Center Twp.; 13,391 ft., 15,774 ft. and 5,994.5 ft. stone and gravel roads in Montgomery Twp.—J. H. Armstrong, Co. Aud., Gibson Co.

Ind., Ft. Wayne. **10 a.m., Jan. 12**
15,892 ft. stone road in Lake and Washington Twps. and 10,588 ft. stone road in Monroe Twp.—A. G. McCoy, Co. Aud., Allen Co.

Ind., Fowler. **1 p.m., Jan. 20**
1.830 ft. gravel road in Center Twp., Benton Co.—W. Mankey, Co. Aud.

Ind., Ft. Wayne. **Jan. 9**
7,380 ft. stone road in Maumee Twp.; 15,828 ft. stone road in Monroe Twp.; and road in Springfield Twp., all in Allen Co.—A. C. McCoy, Co. Aud.

Ind., Terre Haute. **11 a. m., Jan. 17.**
2 roads in Vigo co.—T. Ferguson, Co. Aud.

Ind., South Bend. **10 a. m., Jan. 19**
Concr. and gravel roads in Liberty, Penn, Harris and Union Twps.; 3 concr., asphalt, macadam and gravel roads in Olive and Penn Twp., St. Joseph Co.—A. J. Wolf, Co. Aud.

Ind., Columbia City. **Feb. 4**
13,078 ft. and 13,058 ft. gravel roads on line between Noble and Whitley Co.—W. S. Burwell, Aud., Whitley Co.

Mich., Howell. **1.30 p.m., Jan. 27**
Paving various streets.—G. Champe, Civ. Engr., Toledo, O.

Mich., Lansing. **1.30 p. m., Jan. 16.**
1.484 mi. road in Ovid twp., Clinton co., consisting of shaping road, drainage structures and surfacing to width of 16 ft. with gravel.—F. F. Rogers, State Hwy. Comr.

Mich., Lansing. **1.30 pm., Jan. 12.**
Improving 5.096 mi. roads in Mecosta and Newaygo Cos. by shaping roads, drainage structures and surfacing to width of 16 ft. with gravel.—F. F. Rogers, State Hwy Comr.

Mich., Lansing. **1.30 p.m., Jan. 13.**
Stock 1,400 cu. yd. gravel on state trunk line road in Newaygo Co.—F. F. Rogers, State Hwy. Comr.

Tex., Houston. **10 a.m., Jan. 12.**
Resurfacing streets and paving avenue.—Harris, Co. Engr.

Minn., Duluth. **Jan. 15.**
Grading, surfacing and paving 6,990 ft. 45-ft. roadway with asphalt on 6-in. concr. base, including 13,980 lin. ft. concr curbing.—E. K. Coe, City Engr.

Mo., St. Louis. **Jan. 15.**
Paving 1 blk. in Whittier st. and 5 blks. Morganford rd., 24 ft. wide, vitr. brick, to cost $14,550 and $75,050, respectively.—C. E. Smith, City Engr.

Mo., St. Louis. **Jan. 17.**
Paving street with brick and street with asphalt, both 24 ft. wide.—C. E. Smith, City Engr.

Mo., St. Louis. **Jan. 28.**
Paving 9 blks. city street, 24 ft. wide, with asphalt, granite curbing, to cost $126,000.—C. E. Smith, City Engr.

N. Mex., Santa Fe. **2 p.m., Jan. 14**
14.37 mi. fed. aid proj. No. 1-B in Colfax Co., involving 46,270 cu. yd. class 1 excav., 37,862 cu. yd. class 1 borrow, 23,914 sta. yds. overhaul, 22,386.24 cu. yd. 1-course gravel surfacing, 282 lin. ft. 18-in., 295 lin. ft. 24-in., 66 lin. ft. 30-in. and 44 lin ft. 36-in. corrugated iron culvert, wooden bridges, etc.—L. A. Gillett, State Hwy. Engr.

O., West Union. **Jan. 23.**
6 mi. road through Liberty twp. in Adams co.—E. C. Zimmerman, Co. Engr.

Pa., Harrisburg. **10 a. m, Jan. 27.**
Reconstructing following pavements: 10,600 lin. ft. rein. concr. in Armstrong co.; 3,055 ft. vitr. brick in Beaver co.; 46,966 ft. rein. concr. in Butler co.; 24,207 ft rein. concr. in Cambria co.; 23,420 ft. rein concr. in Carbon co.; 13,027 ft. rein. concr. and Hillside vitr. brick, also 7,291 ft. rein. concr. in Clearfield co.; 18,514 ft. rein. concr., also 18,619 ft. either 1-course rein concr. and Hillside vitr. brick or 2-course rein. concr. and Hillside vitr. brick in Crawford co.; 5,467 ft. rein. concr., also 14,496 ft. rein. concr. and Hillside vitr. brick in Fayette co.; 23,201 ft rein concr. in Greene co.; 14,800 ft. rein. concr. in McKean co.; 20,164 ft. rein. concr. in Northampton co.; 12,925 ft. either bituminous surface course on concr. foundation or rein. concr. in Potter co.; 39,500 ft. rein. concr. and Hillside vitr. brick in Schuylkill co.; 3,419 ft. rein. concr. in Venango co.; 22,287 ft. rein, concr. and Hillside vitr. brick, also 54,577 ft. rein concr in Warren co.; 79,664 ft. rein. concr. and Hillside brick in Westmoreland co.; 41,753 ft. either bituminous surface course on concr. foundation or rein. concr. in Dauphin and Perry cos.—L. S. Sadler, State Hwy. Comr.

Tex., Wichita Falls. **Jan. 22.**
38.36 mi. road 18 ft. wide in Wichita co.—J. M. Isbell, Co. Engr.

Tex, Center. **Feb. 9.**
Roads in road precincts Nos. 1, 2, 3, 5 and 6 of Shelby co.—T. H. Dillon, Co. Engr.

Tex., Snyder. **1 p.m., Jan. 12**
State hwy. in Scurry Co., consisting of grading, surfacing with local gravel 16 ft. wide and 10.5 mi. long, constructing ditches and concr. drainage structures, etc., total length, 21.5 mi.—H. Exall Elrod Co., Engrs., Dallas.

Tex., Liberty. **11 a.m., Jan. 12**
8.5 mi. gravel road, including drainage structures.—H. H. Smith, Liberty Co.

W. Va., Charleston. **11 a.m., Jan. 14**
2.6 mi. road, consisting grading, drainage structures and 1-course plain cement concr. paving, with necessary work.—Co. Engr.

Wis., Hartford. **Jan. 10.**
84,000 bbls. of Portland cement in 1920 in Washington Co.—C. Johnson, Co. Hwy. Comr., Kewaskum.

Ont., Toronto. **Jan. 15**
Furnishing 2,500 survey posts of 1 in. w. i. pipe(30 in. long, welded foot plate and cement filled).—L. V. Rorke, Engr., Parliament Bldgs.

Ont., Finch. **7 p.m., Jan. 19**
Roads in Stormont, Dundas and Glengarry Co., 40.50 mi.—J. G. Cameron Co. Rd. Supt.

SEWERAGE.

Kan. Hanover. **7 p.m., Jan. 19.**
Sewerage work, involving 1,233 lin. ft. 12 in., 27,640 lin. ft. 8 in., 4,888 lin. ft. 10 in. sewer pipe; 1,086 lin. ft. Y's, 37 manholes, 25 flush tanks, one 8-in. flap valve, one 12-in. flap valve, 192 lin. ft. 8 and 12-in. cast iron pipe—Balck & Veatch, Engrs., 507 Interstate Bldg., Kansas City.

Ill., Pana. **8 p.m., Jan. 12**
Sedimentation basin to cost $19,000.—H. Stanton, City Clerk.

Ind., Kokomo. **Feb. 2**
16,100 lin. ft. 15-84-in. sewer pipe and laterals.—Bd. Pub. Wks.

Minn., Little Falls. **Jan. 14**
Sewers, involving 250 ft. 10-in., 1,313 ft. 12-in., 779 ft. 18-in., 810 ft. 20-in. sewer, 1 manhole 8 ft. deep, 1 manhole 10 ft. deep, 2 manholes 12 ft. deep and 2 manholes 13 ft. deep.—C. L. Pillsbury Co., Engrs., 805 Metropolitan Life Bldg., Minneapolis.

Minn., Duluth. **Jan. 15.**
2,330 ft. rein. concr. sanitary sewer.—L. Ayers, City Engr.

Miss. Brookhaven. **7.30 p.m., Jan. 20.**
Sewer system, involving 13 mi. mains and a disposal plant—M. L. Cully, Engr., Jackson.

O. Toledo. **noon, Jan. 13.**
Local sanitary sewers in various city streets—D. H. Goodwillie, Dir. Pub. Serv.

O., Cincinnati. **noon, Jan. 12.**
Sewering street.—Chf. Engr., Dept. Pub. Serv.

O., Greenfield. **Jan. 19.**
Sanitary sewers in various streets, with necessary appurtenances.—E. M. Conner, Vil. Clk.

BIDS ASKED FOR

O., Cleveland. **Jan. 10**
Sewage plant to cost about $800,000.—Cleveland to Montgomery Co. line, in-Comr. Engrg., City Hall.

N. Y., New York. **11 a.m., Jan. 14**
Repairing sewer in city street.—E. Riegelmann, Pres., Boro. of Brooklyn.

WATER SUPPLY.

Ark. Monticello. **Jan. 31.**
400,000-gal. rein. concr. reservoir—Comrs. Water and Light Impvt. Dist. No. 1.

Ia. Avoca. **8 p.m., Jan. 27.**
Steel water tower and wood tank complete; steel water tower and steel tank; concr. water tower and tank, each 105 ft. high and 100,000 gal. capacity—F. Wise, To. Clk.

Mont., Grent Falls. **8 p.m., Jan. 13**
Steel storage stand pipe 54 ft. in diameter and 60 ft. high,—City Engr.

Mo. Vandalia. **Jan. 26.**
Drilling deep weel, 1,200 to 1,500 ft. deep.—City Clk.

O., Akron. **noon, Jan. 9**
48-in. pipe line, including furnishing and laying 4.1 mi. pipe line with appurtenances, between Cuyahoga River pumping station and crossing Cuyahoga River, south of Kent.—H. S. Morse, Dir. Pub. Serv.

N. C., Lexington. **4 p.m., Jan. 20**
Water works impvts., including brick and concr. pumping station, filter house and filter tubs; brick and concr. auxiliary station; concr. coagulating basin; concr. storage resorvoir, 500,000 gal.; 3½ mi. cast iron pipe line; 3½ mi., 2,200-volt transmission line; motor-driven centrifugal pumps and accessories; filter plant equipment.—G. C. White, Engr., Durham.

Wis., Reedsburg. **7.30 a.m., Jan. 12.**
Centrifugal pump, 150 g.p.m., also 200 g. p. m., connected to 3-phase, 60-cycle a. c. motor.—A. F. Niebuks, City Clk.

Ont., Toronto. **noon, Feb. 10**
Installing one or more 16 to 20 million imperial gal. centrifugal pumps at water works main pumping station.—Works Dept., Room 12, City Hall.

Ont., Toronto. **noon, Jan. 17**
5,000 lengths 6-in., 1,000 lengths 12-in. and 1,000 lengths 16-in. cast iron pipes, 500 tons 6-in., 12-in. and 16-in. cast iron specials; 200 6-in., 30 12-in. and 20 16-in. gate valves; 250 hydrants and 250 round cast iron valve covers and frames.—F. Barber, York Twp., Engr., 40 Jarvis St.

Ont., Guelph. **noon, Jan. 19**
Furnishing 1,500 ft. 8-in., 1,500 ft. 12-in. and 15,000 ft. 24-in. wood pipe, to be used in constr. of water supply conduit.—F. McArthur, City Engr.

Can., Toronto. **noon, Jan. 17**
Furnishing 6, 12 and 16-in. cast iron pipes; also gate valves, hydrants and cast iron valve covers and frames.—F. Barber, Twp. Engr., 40 Jarvis St.

LIGHTING AND POWER.

O., Troy. **Jan. 14.**
Steam heating line from co. power plant to Miami co. jail bldg.—T. B. Radebaugh, Co. Aud.

Man., Winnipeg. **3 p.m., Jan. 12**
Supplying quantity of electrically operated oil switches and switching apparatus at power house, Point du Bois.—City Light & Power Dept., 54 King St.

Man. Winnipeg. **3 p. m., Jan. 26.**
Two 3-phase generators for direct connection to double reaction turbines, and spare parts of same; also 1 additional or extension set, furnished and installed.—City Light & Power Dept., 54 King st.

BRIDGES.

Ariz. Florence. **2 p.m., Jan. 19.**
1 rein. concr. arch bridge at Ray, consisting of two 100 clear arches; 130 ft. concr. retaining wall; taking down, loading and shipping and re-erecting one 200 ft. steel span near Winkelman; and furnishing and erecting 200 ft. additional to steel structure with piers, abutments, wings, etc.—E. G. Dentzer, Secy. Hwy. Comn.

Ida., Idaho City. **1.30 p.m., Jan. 12**
Bridge across Payette River near Gardena.—F. Garrecht, Clk., Boise Co.

Ida., Idaho City. **2.30 p.m., Jan. 12**
Bridge across Fayette River near Gardena.—F. Garrecht, Clk. Bd. Co. Comrs.

Mich., Detroit. **10 a.m., Jan. 17**
Subway section of Detroit approach to Belle Isle bridge, consisting of rein. concrete subway and approaches, involving 28,000 cu. yd. dry excav.; 6,200 cu. yd. rein. concr., including footings; 10,000 lin. ft. concr. piles; 12,000 sq. yd. concr. paving base; 2,700 lin. ft. vitr. sewers and drains; remodeling 65 lin. ft. 7-ft. and 3-in. public sewer; constructing temporary trestle to carry street railway and traffic; 42,000 sq. ft. waterproofing.—Esselstyn, Murphy & Hanford, Engrs. and Archts., 810 Marquette Bldg. .. ..

N. C. Raleigh. **noon, Jan. 19.**
2 bridges in Northampton Co. on state hwy., involving 198.81 cu. yd. class A concr.; 810 lin. ft. timber piple; 310 lbs. plates and bolts, 16,701 lbs. rein. steel, etc.—W. S. Fallis, State Hwy. Engr.

Pa., Bethlehem. **Feb. 7.**
Rein. concr. and steel bridge, 1 mi. long, 64 ft. wide, to cost $2,315,000.—C. Hudson, 21 Park Row, N. Y. C., Engr.

Pa., Bethlehem. **noon, Feb. 25**
Hwy. bridge and viaduct across Lehigh River and through part of city of Bethlehem.—Bethlehem Bridge Comn., 53 East Broad St.

S. Dak., Watertown. **2 p.m., Jan. 15**
Wrecking one 50-ft. span rein. concr. bridge over Willow Creek—W. M. Olson, Co. Aud.

S. Dak., Plankington. **2 p.m., Jan. 16.**
One 24-ft. rein. concr. bridge, 20-ft. roadway; one 8-ft. rein. concr. bridge, 20-ft. roadway; one 8-ft. rein. concr. bridge, 52-ft. roadway, all in Aurora Co.—A. V. Depue, Co. Aud.

Wash, Seattle. **10 a.m., Jan. 19.**
Three bridges, 2 in Maple Valley and 1 over Cedar River, all in King Co.—N. M. Wardall, Clk., Bd. Co. Comrs.

Wash., Seattle. **11 a.m., Jan. 26**
Steel superstructure for bridge over Susitna River, 504 ft. steel through span, total length 1,324 ft., including approach spans.—Alaska Engrg. Comn., Bell St. Dock.

MISCELLANEOUS.

Ia., Sidney. **1 p.m., Jan. 15**
East Nishnabotna ditch No. 4 with laterals in Fremont Co., 10.64 mi. long, 24 ft. bottom width, involving 836,000 cu. yd. in main ditch, and 13,000 cu. yd. excav. in laterals.—H. C. Swanson, Co. Aud.

Ia., Wapello. **1 p.m., Jan. 19**
Complete drainage pumping plant in Louisa Co., consisting of two 10-in. centrifugal pumps driven by oil engines.—V. E. Thompson, Engr.

Minn., Minneapolis. **11 a.m., Jan. 12**
Furnishing one portable gravel screening and loading plant.—A. P. Erickson, Co., Aud., Court House.

Mo., St. Louis. **noon, Jan. 27**
Sprinkling streets in 42 dists.—E. R. Kinsey, Pres., Bd. Pub. Serv.

Mo. St. Louis. **noon, Jan. 20.**
Furnishing two double gantry cranes with 4 monorail telphers or four 2-rail trolleys, for North Market municipal dock.—W. T. Findly, Secy., Bd. Pub. Serv.

N. Y. New York. **10.30 a.m, Jan. 10.**
Furnishing motor prison vans and delivery truck to Dept. Correction.—Bd. Purch., Municipal Bldg.

Pa., Harrisburg. **Jan. 19**
Furnishing and installing dumping equipment with hydraulic and hand hoist, on Peerless, Heavy Aviation, Nash, Pierce and Packard chassis.—L. S. Sadler, State Hwy. Comr.

N. Y., New York. **2 p.m., Jan. 15**
Excavating and dredging at site of Eastchester bridge.—G. A. Whalen, Comr. Plant & Structures, Municipal Bldg.

Tex., South Houston. **10 a. m., Jan. 26.**
Ditches near here.—N. G Kolb, Engr.

Wis., West Bend. **10 a. m., Jan. 10.**
Furnishing 83,500 bbls. Portland cement in 1920 for road, bridge and culvert constr. in Washington co.—C. Pick, Secy., Co. State Road & Bridge Committee.

P. R., San Juan. **2 p.m., Feb. 2**
Constructing tower and dwelling for Point Jiguero light station at Rincon.—Supt. Lighthouse, San Juan.

ROADS AND STREETS

Ala., Birmingham—Election for proposed county good roads bond issue will be held Feb. 16, same day constitutional amendment authorizing state highway bond issue $25,000,000 is submitted to voters of Alabama.

Ala., Birmingham—Bids received by City Engineer for improvement of roads at cost $12,000.

Ala., Birmingham—Bd. of Comrs. of Jefferson Co. will order election Feb. 16 upon $5,000,000 road construction bonds. The Chairman.

Ark., Camden—Street Comr. Tom Morton is laying gravel on residence streets of city. Plans are being made to form business district into paving district next spring.

Cal., Los Angeles—Bd. Pub. Wks. receives bids Jan. 15, improving Clementina Ave. et al, involving concrete base, asphalt surface, cement curbs, concrete and granite block gutters, vitr. pipe storm drains, grading and oiling; $75,000. H. B. Ferris, Secy. A. C. Hanson, City Engr.

Cal., Santa Ana—Bd. Supvrs. Orange Co. plans election on $2,500,000 bonds to pave 100 mi. hwy. J. M. Backs, Co. Clerk.

Cal., Sacramento—State will appropriate $450,000 for construction of Overland Trail across Nevada. This $450,000 is to be matched with $450,000 from four Nevada counties which Overland Train traverses and total sum matched in turn by $900,000 from Federal Gov't.

Cal., San Jose—Definite plans for construction of road from Long Bridge to connect with State road into California Redwood Park in the Big Basin were announced. Supervisors are planning to construct road, 6 mi. of which will be entirely new work, in the spring.

Conn., Hartford—State Hwy. Comm. plans to build 14 mi. trunk line between Waterbury and Bristol, 16 ft. wide; $300,000. C. J. Bennett, State Hwy. Comr.

Fla., Titusville—Brevard Co. will shortly vote on $300,000 road bonds.

Ga., Quitman—Bd. of Comrs. Brooks Co. will receive bids until Jan. 7 for $500,000 road bonds. The Mayor.

Ga., Blue Ridge—Fannin Co. voted $100,000 in bonds for constructing roads.

Ia., George—Bids received until about Jan. 10 for 30,000 yds. concrete asphalt, brick or wood paving. Mr. Lehaman, City Clerk. W. E. Buell, Sioux City, Ia., Engr.

Ind., Rochester—Jan. 5, Fulton Co. will sell hwy. bonds totaling $550,506. Wm. H. Biddinger, Treas.

Ky., Lexington—City planning survey will be made at once looking to improvements voted in $1,250,000 bond issue.

La., Lake Charles—H. G. Chalkley, Pres. Police Jury of Calcasien Parish, will receive bids until Jan. 6 for $100,000 road bonds.

La., Opelousas—President of Police Jury of St. Landry Parish will receive bids until Jan. 5 for $75,000 road bonds.

Mich., Detroit—Council approved plans for subway approach to new Belle Isle bridge and authorized Controller Henry Steffens to issue the first $100,000 of $3,-

The Municipal Index

In Which Are Listed and Classified by Subjects All Articles Treating of Municipal Topics Which Have Appeared During the Past Month in the Leading Periodicals.

It is our purpose to give in the second issue of each month a list of all articles of any length or importance which have appeared in all the American periodicals and the leading ones published in other countries, dealing more or less directly with municipal matters. The Index is kept up to date, and the month of literature covered each time will be brought up to within two or three days of publication. Our chief in this is to keep our readers in touch with all the current literature on municipal matters. In addition to the titles, where these are not sufficiently descriptive or where the article is of sufficient importance, a brief statement of its contents is added. The length also is given, and the name of the author when it is a contributed article. Also the name and the place of publication of the periodical in which it appeared.

ROADS AND STREETS.

Work for 1920:

Wisconsin Highway Work for 1920. More than $6,000,000 worth of federal and state aid work contemplated. 1 table, 500 words. Municipal Journal and Public Works, Nov. 1, New York.

Road Work in 1919 and 1920. Text of letter from Chief of Bureau of Public Roads to state highway departments reviewing work of 1919 and forecasting work of 1920; influence of transportation; need of early awards. By T. H. McDonald. 1,300 words. Good Roads, Nov. 26, New York.

Highway Work in Nebraska. $7,019,904 available at present time for road work. 150 words. Municipal Journal and Public Works, Nov. 1, New York.

Next Year's Road Work. Editorial reference to letter by Chief MacDonald of Bureau of Public Roads printed in this issue. 1,000 words. Good Roads, Nov. 26, New York.

Indiana State Highway Program. Commission plans to build 300 miles in 1920; contracts for over 130 miles awarded in 1919. 250 words. Good Roads, Oct. 29, New York.

Preparing for 1920 Road Work. Editorial. 200 words. Municipal Journal and Public Works, Nov. 8, New York.

What About Materials for Our Road Building Programs? 1,500 words. Engineering World, Nov. 15, Chicago.

Indiana's State Highways. $100,000,000 will be spent during next ten years, according to Governor Goodrich. 1 map, 200 words. Municipal Journal and Public Works, Nov. 1, New York.

Proposed Paving Program in St. Louis County, Mo. Brick and asphaltic paving at cost of over $2,000,000 proposed by state highway engineer. 300 words. Good Roads, Oct. 29, New York.

Brick Pavements.

Paving Brick Manufacturers Seek Specification Changes. Lugless brick, standard sand cushion for bituminous fillers and 4-inch base, are among features proposed. 1,200 words. Editorial reference, 400 words. Engineering News-Record, Nov. 13-20, New York.

Success of Asphalt Joint-Filler in Vertical-Fiber Brick Pavements. By C. R. Mandigo, consultg. engr., Western Paving Brick Mfrs.' Ass'n, Kansas City, Mo. 1,100 words. Municipal and County Engineering, November, Indianapolis, Ind.

Vertical Fiber Brick Pavement. Advantages of this type and some of the latest developments; no lugs and bituminous filler. 2,200 words. Municipal Journal and Public Works, Nov. 1, New York.

Is Beam Strength the Important Item in Brick Roads? Valuation of theory must be weighed by experience and practical application; practice shows beam strength not essential. By W. P. Blair, vice-pres., Natl. Paving-Brick Manufacturers' Ass'n. 2,000 words. Engineering News-Record, Oct. 9, New York.

Asphaltic Filler for Brick Pavements. Why sand filler failed; applying asphaltic filler; sand should be hot. By A. D. Dimmick, Asphalt Sales Dept., Texas Co. 2 ills., 1,300 words. Municipal and County Engineering, November, Indianapolis, Ind.

Concrete Pavements:

Cement Concrete Pavements in New Zealand and the United States and Canada. Paper before Roads and Transport Congress, London, by W. E. Bush, city engr., Auckland, N. Z. 5,000 words. Journal of the Institution of Municipal and County Engineers, Nov. 22, London, England.

Protecting Concrete Pavements During Setting. Description of light portable frame devised by G. J. Lynch of Uniontown, Pa. 1 ill., 400 words. Municipal Journal and Public Works, Nov. 15, New York.

Does Rich Concrete in Roads Crack More Than Lean? Letter to editor from B. H. Tong, chief inspector, Concrete Paving, Bismarck, N. D. 500 words. Engineering News-Record, Oct. 23, New York.

An Appraisal of Modern Plant Performance in Concrete Road Construction. Increasing use of machine instead of hand methods only emphasizes importance of managerial ability and organizing genius on part of contractor; machinery cannot make a road job. By H. D. Hammond, Lakewood Engrg. Co., Cleveland, O. 6 ills., 4,000 words. Engineering News-Record, Oct. 30-Nov. 6, New York.

New Specifications of Indiana Highway Commission for Concrete Roads. 1 page ills., 2,000 words. Engineering and Contracting, Nov. 5, Chicago.

Side Hill Loading Plant for Concrete Road. Batch boxes successfully charged through bottom gates in horizontal storage platform built out from hillside. 2 ills., 1,000 words. Engineering News-Record, Nov. 27-Dec. 4, New York.

Concrete Substitutes for Stone. No limit to use of concrete. Letter to editor from a city engineer. 500 words. Municipal Engineering and Sanitary Record, Nov. 20, London, England.

Recent Developments in Concrete Highway Construction. Improved methods of finishing; use of machinery; alley construction; use of reinforcement; reducing prices for pavements. By A. N. Johnson, consltg. hwy. engr., Portland Cement Ass'n, Chicago. Paper before American Society for Municipal Improvements. 3,500 words. Municipal and County Engineering, November, Indianapolis, Ind.

Utilization of Old Concrete Pavements as Foundations. By A. Blanchard, prof. of hwy. engrg., Ann Arbor, Mich. 6 ills., 3,500 words. Municipal and County Engineering, November, Indianapolis, Ind.

Method for Simplifying Concrete Alley Paving. Difficulty overcome by Metzel & O'Hearn, contractors, in Covington, Ky. 1 ill., 400 words. Engineering and Contracting, Nov. 5, Chicago.

Precautions for Concrete Pavement Construction in Cold Weather. 1,500 words. Engineering and Contracting, Nov. 5, Chicago.

Effective Use of Machinery in Concrete Road Construction. Excellent example afforded by new highway now being built between Martin's Creek and Bangor, Pa. 1 ill., 500 words. Engineering and Contracting, Nov. 5, Chicago.

Central Loading Plant Facilitates Street Paving Work. Employed by J. S. McLaughlin & Sons, Red Oak, Ia., in constructing 95,865 square yards concrete street paving at Spencer, Ia. 700 words. Engineering and Contracting, Nov. 5, Chicago.

Bituminous Pavements.

Relative Advantages of Single and Double Coat Road Surfacing Work Carried Out in Bitumen (as Distinct from Tar Compounds). Paper before Roads and Transport Congress, London, by F. Wood, borough engr. and surveyor, Blackpool. 2,000 words. Journal of the Institution of Municipal and County Engineers, Nov. 22, London, England.

Asphaltic Macadam (Bituminous) Roads, and Their Extended Use. Paper before Roads and Transport Congress, London, by H. T. Wakelam, co. engr. of Middlesex. 4,000 words. Journal of the Institution of Municipal and County Engineers, Nov. 22, London, England.

Bituminous Concrete and Brick Roads for Indiana. New state specifications for brick paving and bituminous paving on concrete base; special brick on grades. 1,700 words. Engineering News-Record, Oct. 30-Nov. 6, New York.

Hot-Mix Asphalt Pavements. Comprehensive details regarding this type of modern pavement. By F. P. Smith, chemical engr., N. Y. C. 4 ills., 4,000 words. American City, October, New York.

Storage Tanks for Road Oil Cut Out Demurrage. By C. E. Murphy, Asphalt Sales Dept., The Texas Co. 1 ill., 900 words. Engineering and Contracting, Nov. 5, Chicago.

Macadam and Others.

Resurfacing Old Macadam Streets in Milwaukee. Cost and method employed. By C. J. Van Etta, supt. of street constr. and repair, Dept. Pub. Works. 4 ills., 1,200 words. Municipal and County Engineering, November, Indianapolis, Ind.

Kentucky Practice in Construction of Water Bound Macadam. From paper at Road School at University of Kentucky, by M. D. Ross, div. engr., Dept. of Pub. Roads, Newport, Key. 3,000 words. Engineering and Contracting, Nov. 5, Chicago.

Construction and Maintenance of Gravel Roads. Paper before New Hampshire Good Roads Ass'n, by F. H. Colburn, ass't state engr., N. H. State Hwy. Dept. 4 ills., 1,800 words. Good Roads, Nov. 12, New York.

New Joint Spacer for Wood Block Pavements. Description of methods employed in construction of wood block pavement in the street railway track area in St. Thomas, Ont. By J. S. Crandell, consltg. engr., Gen. Tarvia Dept., The Barrett Co. 2 ills., 300 words. Good Roads, Nov. 26, New York.

Surfacing Old Granite Pavements. Editorial reference to method adopted in many American cities. 250 words. Municipal Engineering and Sanitary Record, Nov. 13, London, England.

Foundations:

Concrete Foundations to Wood, Etc., Paving. Adverse to breaking up old concrete. Letter from B. Cooper, borough surveyor of Paddington. 500 words. Municipal Engineering and Sanitary Record, Nov. 20, London, England.

Concrete Foundations to Wood, Etc., Paving. Honeycombed concrete and subways. Letter to editor from E. F. Spurrell, borough of Holburn. 800 words. Editorial reference, 500 words. Municipal Engineering and Sanitary Record, Nov. 6, London, England.

Foundations for Pavements. Macadam base preferable to cement concrete for brick, bituminous concrete and other

(*Continued on page* 33)

000,000 bonds authorized for project. Comr. Engel of Pub. Works Dept. will advertise for bids on subway contract.

Mich., Muskegon Heights—Representatives at State Hwy. Comn. recommended State highway be constructed on Peck Blvd. and Summit and Merriam Sts.

Mich, Grand Rapids—Bids received by city clerk until Jan. 5 on bonds of $50,000 and 70,000 for street improvement.

Minn., Blooming Prairie—City having plans prepared for 1,500 sq. yds. paving. Bids received on all types of pavement; $100,000. J. W. Schaeffr & Co., New York Life Bldg., Minneapolis, Engr.

Minn., Madison—City having surveys made for 40,000 sq. yds. paving. Bids received on all types of pavement; $200,000. J. W. Shaffer & Co., New York Life Bldg., Minneapolis, Engrs.

Mo., St. Louis—Ordinance drafts authorizing total expenditure of $180,000 for street improvement during next year were approved by Board of Public Service. Bills include appropriation of $117,150 for improvement of King's Highway, $25,800 for Gannett Ave., $20,650 for Ellenwood Ave., $8,500 for Tennesse Ave., and $7,350 for grading Clifton Ave.

Miss., Vicksburg—Election upon $400,000 bonds for paving streets is contemplated. The Mayor.

Miss., Moss Point—City will vote Dec. 30 on $25,000 street bonds.

Neb., Omaha—City Comr. Towl and City Engineer Bruce reported to City Council approval of regrading and repaving St. Marys Ave. Work will involve $200,000.

N. Mex., Roswell—City plans to expend $800,000 for paving principal business streets.

N. Y., Albany—According to plans of State Highway Comr. Greene 10.96 miles in Albany Co. will be reconstructed in 1920. This will include part two of Albany-Schenectady Rd. and River Rd Commissioner has designed 750 miles new roads for 1920 and listed 1,054 miles for resurfacing and 350.70 miles for reconstruction. Concrete will be used in all roads.

N. Y., Albany—In addition to 750 mi. of roads for construction in 1920, Hwy.. Comr. Frederick S. Greene has listed 1,054 mi. for resurfacing, 350 mi. for reconstruction in 57 counties of State. Concrete to be used in nearly all roads ordered rebuilt. In Suffolk Co. the Amityville-Babylon, Amityville Viliage and Babylon Village roads will be reconstructed and 6 mi. resurfaced. In Nassau Co., Jericho Turnpike-Plainview road will be reconstructed and 14.47 mi. resurfaced.

N. Y., Brooklyn—Bd. of Estimate received recommendations for improvement of 26 streets.

N. C., Asheville—McDowell Co. Comrs. have just sold A. T. Bell Co., of Toledo, O., $100,000 road bonds. Money will be used by McDowell Comrs. for building connecting highways with Buncombe and Burke Counties.

N. C., Durham—Durham Co. Comrs. plan to hard surface main highways, 18 ft. wide, $300,000. F. E. Schnepfe, Co. Engr.

N. C., Hendersonville—$3,000,000 for hard surface roads is objective of campaign waged here. Federal and State aid in construction of the roads will be sought.

Okla., Tecumseh—Election will be held soon in Pottawatomie Co. to vote following road bonds: Davis Twp., $100,000; Earlsboro Twp., $50,000; Brinton Twp., $50,000.

Okla., Tecumseh—Pottawatomie Co. voted $500,000 bonds to build roads in Earlsboro, Davis, Brinton, Forest and Rock Creek Twps. L. L. Winans, Tecumseh, Engr.

O., Newark—City engineer estimates cost of paving and sewers in Hudson Ave., Channel St. and North 4th St., at $64,000.

O., Lima—James C. Mackensie of Bd. of Comrs. states that road program in Allen Co. next year will include 24 mi. new construction. State will contribute $300,000.

O., Lorain—County Comrs will pave Lake Shore Rd. 3 mi., at cost $129,000, with either bituminous concrete reinf. concrete or brick.

Ore., Klamath Falls—Klamath Irrigation Dist. will decide in January on issuing bonds amounting to $175,000 for construction work in said district.

Ore., Eugene—Lane Co. voted special levy of $60,000 as mileage tax in different districts to maintain roads during 1920.

Pa., Bethlehem—Mayor of city will receive bids until Dec. 29 for street pavings bonds of $155,000.

Pa., Johnstown—Bids received until Jan. 5, 1920 for $500,000 Cambria Co. road bonds. H. T. Jones, Co. Controller.

Pa., Bethlehem—Ordinances were introduced in City Council and considered as follows: To pay cost of installation of ornamental street lighting fixtures, $80,000; for street paving, West 4th St., $11,000; Lehigh Ave., $20,200; Goepp St., $18,000; Conestoga St., $21,500; Mauch Chunk Rd., $22,000.

R. I., Providence—City council orders curbs to be laid on seven streets and gutter to be paved.

S. C., Spartanburg—Spartanburg will spend $100,000 on roads of so-called Greer area of county, in which Greenville authorities recently promised to expend $875,000 provided that area become a part of Greenville Co. Members of county delegation signed agreement to introduce bill authorizing additional bonds for road building.

Tex., Angletonn—Citizens will vote Jan. 24 on issuing bonds of $100,000 for hard surfacing roads from Houston to Galveston to Freeport.

Tex., Hondo—Medina Co. voted bond issue of $800,000 for road construction.

Tex., Honey Grove—At special election to determine whether or not people would adopt amendment to city charter providing for permanent street improvements carried. City expects to do street paving as soon as weather settles.

Tex., Orange—Chamber of Commerce went on record as favoring construction of high class concrete road from Orange to Beaumont. Hwy. Comm. will recommend to Orange Co. $400,000 be devoted to building this road and appropriations of $200,000 each be sought from federal and State Hwy Depts., making total of $800,000.

Tex., Corsicana—Navarro Co. voted $35,000 bonds to build roads in Dist. No. 6. R. J. Windrow, Austin, State Hwy. Engr.

Tex., Gainesville—Bond issue of $225,000 for roads voted in Era and Valley View Dists. of Cooke Co. Address H. S. Holman, Co. Judge.

Tex., Fredericksburg—Gillespie Co. is drawing plans for road building to cost $113,313.75. A. F. Moursang, Engr.

Wash., Spokane—Early in 1920 bids will be received for construction of 4 mi. of hard surfaced roadway from Liberty Lake junction to State line. Road will cost $90,000. Apple Way will require 5 mi. concr. surface; cost $160,000. Two and a half miles pavement, probably concrete, in Otis Orchard district; cost $75,000. Fifty thousand dollars will be expended on Long Road.; 5 miles will be paved with crushed rock. Monroe Rd. will get $50,000. Day Rd. will require $40,000; 3 mi. will be surfaced with crushed rock or gravel. County is giving $70,000 to city for use in improving arterial connection to city in Stafford's addition.

Wash., Aberdeen—Bond issue of $1,200,000 proposed to make possible $4,000,000 road building program in Grays Harbor Co. during next five years, was indorsed at recent election.

Wash., Chehalis—At good roads meeting of Dist. 25 in Mossyrock paved road from west boundary line of Lewis was discussed. Special committee to start county bonding plan was named.

Wash., White Salmon—Board of co. comrs. decided to advertise for bids on construction of concrete road between here and Trout Lake. Engineer's estimate $411,000.

Wash., Kelso—Nearly 2 mi. of streets will be improved by grading and concrete sidewalks and curbs, according to plans of City Council.

W. Va., Kingwood—Various road improvements contemplated in Preston Co. Estimate, $64,000. H. T. Wilhelm, Engr.

W. Va., Logan—J. W. Smith is preparing plans for Comrs. of Logan Co. for road improvements; total cost, $1,000,000. Work will start in spring.

Wis., Neillsville—Road construction for Clark Co, 1920, will cost $27,310.53, principally grading and draining. W. C. Thoma, Neillsville, Wis.

Wis., Barron—Road construction program was voted by Barron Co. amounting to $23,461.79 Also Portage Co. vote program of $19,035.77.

Wis., Ft. Atkinson—City plans to grade, drain and surface 2.8 mi. Watertown Plank Rd., 18 ft. wide, concrete; $95,000. R. D. Rogers, Co. Engr.

Wis., Port Washington—City plans to grade, pave and drain 2.8 mi. Lake Shore Rd., 18 ft. wide, rein. concr., $90,000. J. H. Mueller, Thiensville, Engr .

Wis., Sparta—Monroe Co. Bd plans to spend $25,849.57 for grading and draining 15 roads. C. H. Millard, Sparta, Wis.

Wis., Fond du Lac—Fond du Lac Co. indorsed proposition to issue bonds of $4,600,000 for construction of permanent highways.

B. C., Port Hardy—It is reported that Provincial Govt. will construct highway between Port Hardy and Coal Harbor next year. Minister of Pub. Works, Hon. J. H. King, Victoria.

P. E. I., Charlottetown—Government is planning to take advantage of federal road grant and expect to expend $400,000 on roads next year.

Ont., Belleville—City having plans prepared and soon receives bids paving William, Charles, Ann, John, Bridge and Pinnacle Sts. Work involves 33,000 sq. yds., 28-33 ft' wide, asphaltic concr. on concr. base; $110,000. J. G. Mill, City Engr.

BIDS RECEIVED AND CONTRACTS AWARDED.

(*Indicates Contracts Awarded.)

***Ark., Little Rock**—Morgan Constn. Co. of Little Rock has been awarded contract for construction of Southwestern Impvt. Dist. No. 1, from Hot Springs to New Hope, 60 mi., for $540,000.

***Ark., Fayetteville**—Contract for 31 mi. hard surface road awarded Phillips Constn. Co., Fayetteville, at $161,417.

Ind., Evansville—Only one bid was received by the Co. Comrs. for improvement of King Rd. in Center Twp. Bid, $17,631, was submitted by Martin & Thornburg.

N. Y., Albany—Mohawk Dock & Dredge Co., next to lowest bidder for first contract of Great Western Gateway project, decline to accept contract at its bid, $228,000. Lowest bidder was Walsh Construction Co., of Davenport, Ia., which originally offered to do the work for $190,000, but declined because of rise in materials and labor. Supt. Pub. Wks. now has asked American Pipe & Construction Co., of Philadelphia, third lowest bidder, to accept job at bid, $235,000.

***N. C., Raleigh**—State Hwy. Comn. let contract for building 21 mi. of road on Central Hwy. in Lenoir Co. Total cost of 21 mi., $705,000. W. H. Gill Co., of Binghampton, will do grading and draining, and laying of sheet asphalt will be done by West Constn. Co., of Chattanooga.

Ore., The Dalles—United Contracting Co. of Portland received contract for grading, basing and surfacing 9 blocks on Elm St., Kelly Ave. and W. 8th St. for total $39,167.80. Construction will start at once.

Pa., Harrisburg—Following bids received Dec. 16, 1919 by State Hwy. Dept.: Allegheny Co., 10,452 ft., one course reinf. concr. pavement, Foster-Waring Constn. Co., Pittsburgh, Pa., $136,081.30.

Armstrong Co., 10,610 ft. one course reinf. concr. pavement, Summit Constn. Co., Akron, O., $119,882.90.

Beaver Co., 5,447 ft. one course reinf. concr. pavement, W. S. Morrison, New Brighton, Pa., $55,939.90.

Beaver Co., 13,592 ft. one course reinf. concr. ad Hillside brick pavement, Foster-Waring Constn. Co., Pittsburgh, Pa., $155,959.20; S. B. Markley, Rochester, Pa., $150,770.95.

Beaver Co., 12,062 ft. one course reinf. concr. and Hillside vit. brick, Jones Constn. Co., Salem, O., $199,920.90; Samuel Gamble Co., Carnegie, Pa., $180,920.60.

Beaver Co., 5,200 ft. one course reinf. concr. pavement, Jones Constn Co., Salem, O., $97,806.10; M. J. Scanlon, Newcastle, Pa., $96,178.80.

Berks Co., 29,700 ft. one course reinf. concr. pavement, Henry E Baton, Philadelphia, $251,857.05; Weller Constn. Co., Inc., Washington, D. C., $221,128.35.

The Municipal Index

kinds of wearing surface; opinions of four speakers at the A. S. M. I. convention. 2,500 words. Municipal Journal and Public Works, Nov. 15, New York.

Non-Rigid Pavement Foundations. At American Society for Municipal Improvements, several paving experts advocated use of old macadam or new macadam as preferable to new concrete base for durable pavements. Editorial. 300 words. Municipal Journal and Public Works, Nov. 15, New York.

Tile Drainage for Iowa County Highways. Untiled areas of "seedling mile" concrete road cracked, while later sections laid with tile remained intact. By J. A. King, Mason City, Ia. 1 ill., 1,200 words. Engineering News-Record, Oct. 23, New York.

Maintenance:

Tractor for Road Maintenance. Comparative costs of grader maintenance in Cherokee county, S. C., by kerosene tractor and by mule team power. 1 ill., 300 words. Good Roads, Oct. 29, New York.

How Drivers Can Help Maintain Good Roads. 400 words. Engineering and Contracting, Nov. 5, Chicago.

Gang Patrol System for Maintenance of Lucas County, Ohio, Highways. 2 ills., 500 words. Engineering and Contracting, Nov. 5, Chicago.

Prepare Roads for Winter. Editorial. 150 words. Municipal Journal and Public Works, Nov. 8, New York.

Compressed Air Used to Clean Road Surface Before Oiling. Road first swept with brooms and then blown with compressor; cost of cleaning and application of binder given. By Maj. W. A. Welch, chf. engr. and gen. mgr., Palisades Interstate Park. 1 ill., 1,200 words. Engineering News-Record, Nov. 27-Dec. 4, New York.

Principles:

Road Impact Tests. Have been continued by Bureau of Public Roads during past few months with Class B army truck, 5½ ton, equipped with solid tires. 500 words. Municipal and County Engineering, November, Indianapolis, Ind.

Impact of Trucks Upon Road Surfaces. Preliminary report on experiments being carried on by the Bureau of Public Roads to determine effect upon road surfaces of motor trucks running at various rates of speed. By E. B. Smith and J. T. Paulssen, ass't testing engr. and hwy. engr., respectively. 3 ills., 1,500 words. Editorial comment, 600 words. Good Roads, Nov. 5, New York.

Comprehensive Investigation in Highway Engineering Needed. No adequate basic theories; diculties of problem. By T. R. Agg, Iowa State College. 1,400 words. Southern Good Roads, November, Lexington, N. C.

Engineers Teach Doctrine of Designed Roads. Systematic instruction converts Iowa to active support of engineering direction of road construction work. 2,200 words. Engineering News-Record, Nov. 27-Dec. 4, New York.

Problems Affecting Design and Construction of Highways. From address before N. Y. Chapter of American Ass'n of Engrs., by W. G. Thompson, state hwy. engr., N. J. 1,200 words. Canadian Engineer, Nov. 20, Toronto, Can. Engineering and Contracting, Nov. 5, Chicago.

Paving Half-Roads. Only possible plan for avoiding detours is to complete one-half of stretch of road, traffic meanwhile using other side of center line of road; advantages of marking line down center of a paved road. 700 words. Municipal Journal and Public Works, Nov. 22, New York.

General Principles of Road Administration. Equitable form of taxation must be evolved; road building under bond issue. From paper before Engineers' Club of Northern Minnesota, by R. W. Acton, county engr., St. Louis co., Minn. 2,400 words. Engineering and Contracting, Nov. 5, Chicago.

New Method for Adjusting Earth Excavation and Determining Haul. Use of excess area diagram; allignment and grade revisions for balancing quantities. 10 ills., 3,200 words. Engineering and Contracting, Nov. 5, Chicago.

Streets:

New San Francisco Street Signs. 2 ills., 300 words. Municipal Journal and Public Works, Nov. 15, New York.

Shade Trees for Business Streets. Sacramento, Calif., vastly improves trade center with attractive foliage. 2 ills., 500 words. American City, November, New York.

Baltimore's Paving Recorded by Map and File System. Complete data of even oldest pavements are being compiled; special colored maps and supplementary card system used. By R. K. Compton, chn. and consltg. engr., Baltimore Paving Comm. 2 ills., 1,100 words. Engineering News-Record, Nov. 13-20, New York.

Characteristics of Pavement Types and Consideration Affecting a Choice in Kansas Cities. By A. P. Learned, of Black & Veatch, consltg. engrs., Kansas City, Mo. 3,700 words. Municipal and County Engineering, November, Indianapolis, Ind.

Financial:

Good Roads Without Great Debt in Bond Issues. New Iowa law provides pay-as-you-go plan for 6,278-mile system of state roads; motor vehicle fees to be utilized. 2 ills., 1,200 words. Engineering News-Record, Oct. 9, New York.

$1,265,000,000 of Highway Bond Issues Proposed or Authorized in 1919. 300 words. Engineering and Contracting, Nov. 5, Chicago.

Proper Use of Federal Aid Funds. Discussion of resolution: "Resolved, That Federal Aid Funds Should Be Used Only for the Construction of Trunk Line Roads and Bridges of Adequate Width and Strength." By N. P. Lewis, chf. engr., Bd. of Estimate and Apportionment, N. Y. C. Paper before American Road Builders' Ass'n. 1,500 words. Good Roads, Nov. 19, New York.

Proposed Schedule of Salaries for Engineers in State Highway Service. 1,300 words. Municipal and County Engineering, November, Indianapolis, Ind.

Miscellaneous:

Texas Progress Chart. Issued biweekly and contains records for 117 federal aid projects and 98 state aid. 1 ill., 300 words. Municipal Journal and Public Works, Nov. 8, New York.

Road Site Built Up by Grass. 1 ill., 250 words. Municipal Journal and Public Works, Nov. 8, New York.

The American Highway Problem. President A. R. Hirst's address before the American Ass'n of State Highway Officials, Louisville, Ky. 6,500 words. Engineering News-Record, Nov. 13-20, New York.

The Future Highways of Vermont. Present progress too slow; necessity of making study of problem; kind of system needed; types of roads to be built; highway department organization; cost of the work. By T. W. Dix, ass't prof. of highway engrg., University of Vermont. 1,800 words. Good Roads, Nov. 26, New York.

Good Roads in Europe. From article in Charlotte Observer by the editor, W. H. Harris, while traveling in Europe. 1 ill., 1,500 words. Southern Good Roads, November, Lexington, N. C.

Highways to Lower the H. C. L. Cost of transportation big factor in price of goods. By J. S. Beal. 2 ills., 1,600 words. Southern Good Roads, November, Lexington, N. C.

Interstate Highways Must be Built by the State. Address by W. A. McGirt, pres., N. C. Good Roads Ass'n. 1,300 words. Southern Good Roads, November, Lexington, N. C.

Reconstruction of Narrow Trunk Highways. Progress report of committee of American Road Builders' Association on "Reconstruction of Narrow Roadways of Trunk Highways with Adequate Foundations and Widths for Motor Truck Traffic." 900 words. Good Roads, Nov. 19, New York.

Good Roads as Factors in Reducing Transportation Costs. Day not far distant when trucks will be run over specially built highways. By E. A. Williams, Jr., pres., Garford Motor Truck Co. 1,200 words. Good Roads, Nov. 19, New York.

Progress in Road Paving. Editorial reference to facts brought out at the convention of the American Society for Municipal Improvements. 150 words. Municipal Journal and Public Works, Nov. 8, New York.

Problems Before Road Builders. Editorial reference to the presidential address at American Road Builders' Association, published in this issue. 1,200 words. Good Roads, Nov. 12, New York.

Presidential Address at Annual Meeting of American Road Builders' Association. By G. P. Coleman, state hwy. engr. of Virginia, elected president of the association. 1,500 words. Good Roads, Nov. 12, New York.

Colorado Highways. Up to November federal aid projects approved totaled 882.9 miles. 100 words. Municipal Journal and Public Works, Nov. 1, New York.

Hard-Surfaced Roads. Discussion of different types, with special reference to conditions in North Carolina; methods of construction and causes of failure of different pavements. Paper before N. C. Good Roads Ass'n, by E. J. Wulff, sen. hwy. engr., Bureau of Public Roads. 3 ills., 2,500 words. Good Roads, Oct. 22. 3 ills., 2,000 words, Oct. 29, New York.

Labeling Roads. Editorial advocating erecting along improved roads sign designating kind of pavement, date of construction and name of contractor. 800 words. Good Roads, Oct. 29, New York.

Permanent Pavements at Railway Stations and Freight Terminals. By C. Campbell. 6 ills., 1,000 words. Engineering World, Nov. 15, Chicago.

Suggested General Highway Traffic Regulations. By the highways transport committee of the U. S. Council of Nat'l Defense. 3 ills., 2,700 words. American City, October, New York.

Economic Status of Guarantees for Pavements on Roads and Streets. Final report of committee to American Road Builders' Ass'n. 1,200 words. Canadian Engineer, Nov. 27, Toronto, Can.

Use of a Self-Computing Level Rod in Highway Surveys. By R. T. Brown, chief of surveys, State Highways Dept. of South Carolina. 1,200 words. Engineering and Contracting, Nov. 5, Chicago.

American Road Builders' Association. Account of the meeting held in New York. 2,200 words. Good Roads, Nov. 12, New York.

Roads and Transport Congress and Exhibition. Preliminary survey and description of exhibits. 10 ills., 8,500 words. Municipal Engineering and Sanitary Record, Nov. 13, London, England.

SEWERAGE.

Sewers:

Building the Augusta Street Concrete Intercepting Sewer. Excavation on the sewer; the invert; forms for the arch; crossing street railway. By W. T. Christine. 4 ills., 1,900 words. Engineering World, Nov. 1, Chicago.

Multiple Outlet Provides for Variable Sewage Flow. Regulation and distribution of sewage discharge through seven outlets into Calumet-Sag canal. By S. T. Smetters, ass't bridge engr., sanitary dist. of Chicago. 4 ills., 1,000 words. Engineering News-Record, Oct. 16, New York.

Heavy Rain Destroys Sewer and Railway at St. Louis. City delayed taking engineer's advice after earlier damage; about 4 inches of rain in 2½ hours. By W. W. Horner, chf. engr., sewers and paving, St. Louis, Mo. 2 ills., 700 words. Engineering News-Record, Nov. 27-Dec. 4, New York.

Sewage Pumping:

Underground Sewage Pumping Plant. Circular station entirely underground being constructed at Walkerville, Ont. From description in recent edition of "Canadian Engineer." 2 ills., 500 words. Engineering and Contracting, Nov. 12, Chicago.

Sewage Pumping in Business District. 1 ill., 200 words. Municipal Journal and Public Works, Nov. 1, New York.

Sewage Treatment:

Economic Values in Sewage and Sewage Sludge. Great difficulties incident to recovery of grease and fertilizer from sewage, and possibilities of attaining that end by modification of Cobwell process of garbage treatment. From paper before American Society of Municipal Improvements, by Raymond Wells, chemist and technologist, Homer, N. Y. 5,500 words. Engineering News-Record, Nov. 27-Dec. 4, New York.

House Refuse Used for Sewage Filters. Remarkable success obtained at Leek. Letter to editor from W. E. Beacham, engr. and surveyor, Leek. 800 words. Editorial reference, 700 words. Municipal Engineering and Sanitary Record, Nov. 6, London, England.

The Problem of Sewage Disposal at Shanghai, India. The activated sludge process; temperature effects; an exceptional sewage. From preliminary report

(*Continued on page 35.*)

Berks Co., 14,260 ft. one course reinf. concr. pavement, Cotton & Corson Co., Ocean City, N. J., $132,921.60; Bennett & Randall, Lebanon, Pa., $105,852.18.

Butler Co., 16.133 ft. one course, reinf. concr. pavement, M. J. Scanlon, New Castle Pa., $221,016.40.

Butler Co., 31,663 ft. one course reinf. concr. pavement, C. E. Walter, Butler, Pa., $316,042.30.

Carbon Co., 23,420 ft. one course reinf. concr. pavement, Osborne Morgan, Wilkes-Barre, Pa., $232,607.28.

Centre Co., 1,720 ft. one course reinf. concr. pavement, Spruks Co., Scranton, Pa., $45,248.24; Frank Murphy, Altoona, Pa., $38,783.98.

Centre Co., 5,326 ft. vit. brick pavement, Leo. E. Kelly, Brooklyn, N. Y., $154,878.45.

Chester Co., 11,523 ft. one course reinf. concr. pavement, Henry E. Baton, Philadelphia, Pa., $99,281.89; Michael Staub, Hammonton, N. J., $113,191.61; Winston & Co., Pottstown, Pa., $94,892.40.

Clearfield Co., 39,911 ft. one course reinf. concr. pavement, Warren Bros. Co., Boston, Mass., $415,450.90; A.: L. Anderson & Bros., Inc., Altoona, Pa., $501,-776.10.

Delaware Co., 10,700 ft. one course reinf. concr. pavement, Sutton & Corson Co., Ocean City, N. J., $92,829.10; Michael Staub, Hammonton, N. J., $104,855.22.

Elk Co., 3,169 ft. one course reinf. concr. pavement, Fish, Young & Parks, Philadelphia, Pa., $47,261.85; C. A. McDonald, DuBois, Pa., $42,620.83.

Elk Co., 7,543 ft. one course reinf. concrete pavement, Miller Constn. Co., Punxsutawney, Pa., $95,964.35.

Elk Co., 25,563 ft. one course reinf. concrete pavement, Warren Bros. Co., Boston, Mass., $85,721.15.

Erie Co., 10,600 ft. one course reinf. concr. pavement, Henry Shenk Co., Erie, Pa., $93,560.75; Chas. H. Fry Constn. Co., Erie, Pa., $70,527.43.

Erie Co., 21,268 ft. one course reinf. concr. pavement, Chas. H. Fry Constn. Co., Erie, Pa., $164,270.31; Henry Shenk Co., Erie, Pa., $183,779.64.

Erie Co., 21,109 ft. one course reinf. concr. pavement, Summit Constn. Co., Akron, O., $193,399.14.

Fayette Co., 960 ft. one course reinf. concr. pavement, Lawrence Schultz & Son, Fredonia, N. Y., $14,751.75; Petriello Bros., South Brownsville, Pa., $15,065.

Fayette Co., 5,475 ft. reinf. concr. pavement, Petriello Bros. & Co., South Brownsville, Pa., $15,065.

Fayette Co., 5,475 ft. reinf. concr. pavement, Petriello Bros & Co., South Brownsville, Pa., $66,072.20.

Fayette Co., 4,889 ft. one course reinf. concr. Hillside vit. brick pavement, Petriello Bros. & Co., South Brownsville, Pa., $54,105.60.

Fayette Co., 15.323 ft. one course reinf. concr. Hillside vit. brick pavement, Thos. Arrigo, Charleroi, Pa., $161,608.30.

Greene Co., 12,581 ft. one course reinf. concr. pavement, E. E. Morris and T. Riley Huffman, Waynesburg, Pa., $201,-444.15.

Lawrence Co., 14,611 ft. one course reinf. concr. pavement, Aronberg & McDonald, New Castle, Pa., $135,000.40; Foster Waring Constn. Co., Pittsburgh, Pa., $159,463.50.

Lawrence Co., 11,625 ft. one course reinf. concr. pavement, M. J. Scanlon, New Castle, Pa., $124,956.97; Burns Bros., New Castle Pa., $134,484.10.

Montgomery Co., 8,598 ft. either bituminous surface course on concr. foundation or one course reinf. concr. pavement, Fish Rutherford, Inc., Philadelphia, Pa., $73,007.98; Michael Staub, Hammonton, N. J., $89,357.60.

Northampton Co., 15,000 ft. one course reinf. concr. pavement, Smith, McCormick Co. & McInerey & McNeal, Inc., Easton, Pa., $165,523.20; Trinidad Asphalt Paving Co., Larksville, Pa., $225,026.50.

Northumberland Co., 31,200 ft. one course reinf. concr. pavement, H. B. Sprout Constn. Co., Inc., Scranton, Pa., $272,559.50; Arthur McMullen Co., Philadelphia, Pa., $231,883.20.

Northumberland Co., 18,140 ft. one course reinf. concr. pavement, Fiss & Christiano, Shamokin, Pa., $171,630.90; Mason & Hanger Co., Inc., Poxinos, Pa., $173,707.36.

Potter Co., 8,358 ft. either bituminous surface course on concr. foundation or one course reinf. concr. pavement, Chenango Constn. Co., Syracuse, N. Y., $89,-894.02; Geo. Metzger, Jr., Emporium, Pa., $99,020.67.

Somerset Co., 5,900 ft. one course reinf. concr. pavement, Frank H Zeigler, Somerset, Pa., $48,447.70; C. J. Newman, L. A. Myers, C. A. Way & H. W. Way, Boswell, Pa., $70,033.55; J. Franklin Norris, Somerset, Pa., $53,397.98.

Susquehanna Co., 3,844 ft. one course reinf. concr. and Hillside vit. brick pavement, Michael Barber, Binghampton, N. Y., $38,352.20; O. B. S. Co., Philadelphia, Pa., $59,619.50.

Tioga Co., 6,280 ft. one course reinf. concr. pavement, John C. Bradley & Co., Wellsboro, Pa., $80,037.46; R. J. DeLong, Williamsport, Pa., $78,017.20.

Warren Co., 2,080 ft. one course reinf. concr. pavement, James P. Morrissey, Dunkirk, N. Y., $39,656.50..

Westmoreland Co., 9,184 ft. one course reinf. concr. Hillside vit. brick pavement, McCrady Bros. Co., Braddock, Pa., $138,-195.35.

Westmoreland Co., 32,047 ft. one course reinf. concr. and Hillside vit. brick pavement, McCrady Bros. Co., Braddock, Pa., $13,866.50; Langthorn Co., Inc., New York City, $478,204.78.

Westmoreland Co., 57,588 ft. on ecourse reinf. concr. and Hillside vit. brick pavement, Warren Bros. Co., Boston, Mass., $868,985.87.

***S. C., Greenwood**—Contract for Callison Rd., 11.1 mi. long, Greenwood Co., awarded W. N. Thompson, Chester, at $51,500.

***Tex., Clarendon**—City Comn. awarded contract for 18 additional blocks of brick paving through residential section of city to Panhandle Constn. Co.

***Wash., Olympia**—Contract for grading 6 mi. of Inland Empire Highway in Columbia Co. awarded G. L. Stickler, Asotin, $95,184; grading and surfacing 10 mi. Garfield Co., General Construction Co., Spokane, at $184,002; paving 10 mi. in Walla Walla and Franklin Counties, to W. J. Smith, Ritzville, at $72,614. Contract for 2 mi. road Chelan Co. awarded Rajotte, Forbet & Winters, 514 Ziegler Bldg., Spokane, $78,535; grading 1.5 mi. of road leading south from Keller, to Root & Joslin, Monroe St., Spokane, at $21,491.

***Wis., Menomonie**—Following road contracts were let to Herman Schroetter, Jim Falls, Wis.: Colfax-Sand Creek Rd., grading and gravel surfacing, $2,168; Wheeler-Prairie Farm Rd., grading and clay surfacing, $1,590; Menomonie-Colfax Rd., grading and culverts, $916. Ali Dunn Co. Frank Stewart, Menomonie, Wis., Comr.

***Wis., Rhinelander**—Contract for building Eagle River Rd., in Oneida Co., was let to Ben Williams, McNaughton, Wis., for $5,761.50.

SEWERAGE AND SANITATION

Ga., Leslie—Election ordered upon issuance of municipal bonds for constructing sewers and water works system. F. A. Wilson, Mayor.

Ill., Decatur—City plans election in January to vote $800,000 bonds to build 14,000 ft. intercepting sewers, various sizes. S. A. Greeley, 39 West Adams St., Chicago, Engr.

Ill., East Moline—City plans to build 10,000 ft. 36-84-in. sewers in various streets; $230,000. W. L. Warnes, City Engr.

Ill., Burr Oak—City contemplates construction of sanitary sewer costing $75,-000. E. A. Rossiter, Clark St., Chicago.

Kans., Topeka—Five-ft. sewer has been proposed by city engineer as temporary expedient for solution of South Topeka drainage problem.

La., Monroe—City Council voted for improvements and plans are being made for 27 mi. house sewers, 8 to 42 in. diameter, system of drainage sewers 15 in. to 42 in. diameter; cost, $490,000.

Md., Balt'more—Highway Engineer Weighardt submitted estimate for providing new territory as well as unsewered parts of city with system of sanitary sewers and storm water drains, $30,000,000.

Mich., Grand Rapids—Bids received by city clerk until Jan. 5 on $10,000 sewer construction bonds. J. C. Shinkman, city clerk.

Mich., Saginaw—City having plans prepared for sewers in several streets; $30,000. H. H. Eymer, Engr.

Minn., Benson—Plans being drawn for sanitary and storm sewers; cost, $60,000. Bradley Engineering Co., St. Cloud, Minn.

Minn., Duluth—City comrs. receive petition to build sewer system in Norton Fairmont Park. J. A. Farrell, comr.

Neb., Loup City—City passed resolution to construct sewers in Dist. No. 1; estimate, $75,000.

N. Y., Rochester—City passed ordinance providing sewers in Hillside Ave., Edgar St. and Bengal Terrace at cost $80,000; also for outlet sewers in Maple and Field Sts., at cost $50,800.

N. D., Kenmare—City plans to install storm sewer system. Estimate $15,000.

O., Oakwood—Engr. R. G. Allen of Dayton is making plans for sanitary sewers; total cost $200,000.

Utah, Bingham—Box Elder Co. Comrs. appointed Engineer B. McBride, Logan, to prepare plans for draining Bear River. Estimate, $100,000.

W. Va., Clarkburg—Plans being prepared for storm drainage and 5 bridges for city at total cost $115,000. John C. Craddock, Mayor.

Wis., Kohler—City having surveys made for sanitary sewerage system; $75,-000. J. Donohue, York Bldg., Sheboygan, Engr.

Ont., Belleville—City having plans prepared and soon receives bids building 5,000 ft. 10-15-in. vitr. sewers in Dufferin Ave.; $125,000. J. G. McGill, City Engr.

Que., Three Rivers—Council plans construction of sewers at cost $75,000. Engineer, Z. St. Lambert.

BID SRECEIVED AND CONTRACTS AWARDED.

(*Indicates Contracts Awarded.)

***Wash., Seattle**—Bd. of Public Works awarded following contract: 63d Ave., S. W., et al, by trunk sewer, etc., to Sweeney & Gallucci, Tacoma, on bid $170,793.80 for alternate segmental block and clay pipe sewer.

WATER SUPPLY

Cal., San Francisco—J. S. Dunnigan, Clerk of Bd. of Supervisors, will receive bids until Jan. 5 for $29,220,000 water bonds.

Colo., Vena—Will vote Jan. on $25,000 water bonds.

Colo., Colorado Springs—Comrs. of El Paso. Co. will expend $16,000 in laying new pipe lines, repairing a reservoir and improving water system at county farm.

Ill., Decatur—City receives bids in January building concrete and earth impounding dam, 1,900 ft. long, 28½ ft. high at spillway; $500,000. S. A. Greeley, 39 W. Adams St., Chicago, Engr.

Ill., Jacksonville—City Clerk receives bids January building filtration plant, 1,500,000 gal. capacity; $50,000. S. A. Greeley, 39 W. Adams St., Chicago, Engr.

Ind., Michigan City—City plans to build water works plant; $150,000. C. Brossman, 1503 Merchants Bank Bldg., Indianaopolis, Engr.

Mich., Ironwood—City election in January to vote on bonds to build new water works system at Spring Creek. Plans include 3 electrically and 2 auxiliary gasoline driven centrifugal pumps. Estimated cost $435,000.

Mich., Pontiac—City plans election in April to vote on bonds to build filter plant, 10,000,000 gal. daily capacity. C W. Hubbell, 2348 Penobscot Bldg., Detroit, Engr.

Mont., Great Falls—City voted $225,000 bonds to improve water works system. L. B. Evenson, City Engr.

N. J., Asbury Park—Water Supt. Robt. Bartley, Jr., has prepared plans for installation of new equipment at city water station, including system of oil burning engines. Cost, $112,000.

N. J., Newark—Contracts for building main dam for Wanaque water shed will be let in short time, according to Chief Engineer Sherrerd.

N. Y., Watervliet—City Chamberlain Chas F. Polk will receive bids until Dec. 30 for $50,000 water bonds.

The Municipal Index

by C. H. Godfrey, municipal engr. 3,200 words. Water and Water Engineering, Nov. 20, London, England.

Capacities of Small Septic Tanks. Few data available for designing sizes; standards of capacities fixed by North Carolina Board of Health. By S. E. Peters. 1,300 words. Municipal Journal and Public Works, Nov. 22, New York.

Agreement Reached for Packing-Town Sewage Disposal. Activated-sludge sewage treatment plant for stock yards. 1,600 words. Engineering World, Nov. 1, Chicago.

Preventing River Pollution from Albany Sewage. New sewage disposal works constructed before the war are now in operation. By F. R. Lanagan, city engr., Albany, N. Y. 3 ills., 1,000 words. American City, November, New York.

Disinfection of Sewage. Results obtained at Millville and at Camp Merritt by the use of chlorine gas; tests made by State Department of Health. From "The Cornell Civil Engineer" for October, somewhat condensed, by C. G. Wigley, Wallace & Tiernan Co. 2 tables, 1,400 words. Municipal Journal and Public Works, Nov. 15, New York.

Sewage Treatment Report Forms and Testing Apparatus. Monthly blank sheet for daily test records and apparatus for finding settleable solids and sludge depths. By E. J. Tully, chemist, State Board of Health, and J. H. Mackin, operating engr., Madison Sewage Works. 3 ills., 1,000 words. Engineering News-Records, Oct. 30-Nov. 6, New York.

Experiments to Adapt Cobwell Process to Handling Sewage Sludge. Abstract of paper by Raymond Wells, consltg. chemist, Homer, N. Y., before American Society for Municipal Improvements. 1,500 words. Engineering and Contracting, Nov. 12, Chicago.

Economic Values in Sewage Sludge. No net return probable unless ammonia exceeds three per cent; decreasing market value of products. 3,800 words. Municipal Journal and Public Works, Nov. 8, New York.

Testing Discharge of Sprinkling Filter Nozzles. By W. E. Weller, city engr., Binghamton, N. Y. 6 ills., 600 words. Municipal and County Engineering, November, Indianapolis, Ind.

Washing Sewage-Filter Gravel at Clinton, Mass. Dirty material moved to washer by drag scoops and hauled back by same means; cost $11.75 per cubic yard. 700 words. Engineering News-Record, Oct. 23, New York.

Millions in Sewage and Garbage. Editorial. 150 words. Municipal Journal and Public Works, Nov. 1, New York.

The Activated Sludge Plants at Manchester, Eng. Editorial. 500 words. Municipal Engineering and Sanitary Record, Nov. 13, London, England.

Diagram Adaptation of the Rational Method of Storm-Water Drain Design. Review of maps, population estimates, rainfall intensities, probability charts and various instruments and methods associated with storm-sewer design, and illustration of how diagram is used. By H. G. McGee, hydraulic and sanitary engineer, Des Moines, Ia. 7 ills., 5 tables, 3,200 words. Engineering News-Record, Nov. 13-20, New York.

The New Sewage Treatment Plant at Montezuma, Ia. Notes from article by J. H. Dunlap, asso. prof. of hydraulics and sanitary engrg., State University of Iowa, in recent issue of "Transit." 500 words. Engineering and Contracting, Nov. 12, Chicago.

Sewage Treatment Plant at Montezuma. Relation to design of plant to funds available; unit costs to date. By J. H. Dunlap, asso. prof. hydraulic and sanitary engrg., State University, Iowa City, Ia. 6 ills., 5,000 words. Municipal and County Engineering, November, Indianapolis, Ind.

Treatment of Gas Waste to Prevent Water Pollution. Tar and oil separators, aerators and chemical treatment in some cases, coke contact and fine gravel-sand beds. By E. J. Tully, chemist, State Board of Health, Madison, Wis. 2 ills., 900 words. Engineering News-Record, Nov. 27-Dec. 4, New York.

Sanitation:

Various Current Phases of Sanitary Engineering. Brief abstracts of papers, reports and resulting discussions at the New Orleans meeting of the American Public Health Association. 2,700 words. Engineering News-Record, Nov. 13-20, New York.

Restoring Sanitation in Palestine. Early hydraulic engineering in Palestine; new water supplies; abolishing malaria. By H. Y. Carson, formerly capt. and sanitary engr., Red Cross Comn. to Palestine. 3 ills., 2,000 words. American City, October, New York.

Sanitation and Municipal Death Rates. Beginning of municipal sanitation; technical advice essential; health should determine appropriation. From paper before Pan-American Commercial Conference, by G. A. Soper, maj., Sanitary Corps, U. S. A. 1,800 words. Canadian Engineer, Nov. 20, Toronto, Can.

Result of Malaria Mosquito Survey in Northern California. 400 words. Engineering and Contracting, Nov. 12, Chicago.

WATER SUPPLY.

Pumping:

Air Lift Pumping. The individuality of wells; should avoid large bubbles; misleading results. Paper before Iowa section of American Water Works Ass'n, by Charles J. Deem, hydro-pneumatic engr., Harris Air Pump Co., Chicago. 3,500 words. Canadian Engineer, Nov. 6, Toronto, Can. 5,500 words. Municipal and County Engineering, November, Indianapolis, Ind.

Pumping Water for Irrigation Makes Important Power Load. By W. A. Scott. 1,000 words. Engineering World, Nov. 1, Chicago.

Electric Well Pumping in Savannah. 200 words. Municipal Journal and Public Works, Nov. 1, New York.

Starting Work on World's Largest Pumping Station. Estimated cost of Chicago's tunnel is $3,500,000. 2,000 words. Engineering World, Nov. 15, Chicago.

Belleville, Ont., Water Supply. New electric pumps installed; comparison of cost of pumping for 1916 and 1919. 1 ill., 800 words. Canadian Engineer, Nov. 6, Toronto, Can.

Mains:

An Experience with a Broken 24-Inch Water Main. Paper before Iowa section of American Water Works Ass'n, by S. L. McEntyre, supt., Council Bluffs, Ia., city water works. 800 words. Canadian Engineer, Nov. 6, Toronto, Can.

Willow Root, 24 Feet Long, Is Taken from a 10-Inch Wooden Water Main. 1 ill., 350 words. American City, November, New York.

Reinforced Concrete Pipe Made by Centrifugal Process. Cylindrical form is placed around wire-covered mandrel, concrete is poured and whole rig spun until concrete sets. By E. M. Weston, Union Club, Johannesburg, South Africa. 1 ill., 700 words. Engineering News-Record, Oct. 9, New York.

Water Supplies:

Watershed Leakage in Relation in Gravity Water Supplies. By R. E. Horton, consltg. hydraulic engr., Voorheesville, N. Y. Abstract of paper before New England Water Works Ass'n. 1,000 words. Engineering News-Record, Oct. 30-Nov. 6, New York.

Schoharie Development Involves Dam and 18-Mile Tunnel. Abstract of paper before New England Water Works Ass'n, by J. Waldo Smith, chf. engr., bd. water supply, N. Y. C. 3 ills., 400 words. Engineering News-Record, Oct. 30-Nov. 6, New York.

Determination of Water Supply from Snow Fields. Important for irrigation and hydraulic works; snow sampler measurements and tables based on extended investigations made in the Sierra Nevada mountains. 1 ill., 2 tables, 1,500 words. Engineering News-Record, Oct. 23, New York.

Shandaken Water Supply Tunnel Job Will Require 2,000 Men for Five Years. 1 ill., 800 words. Engineering and Contracting, Nov. 12, Chicago.

Development and Storage of Water for Electrical Purposes. Canals and open channels; forebay reservoirs; pressure pipes; tail races. Abstract of paper before Institution of Electrical Engineers, by J. W. Meares. (Continued.) 4 ills., 4,000 words. Water and Water Engineering, Nov. 20, London, England.

Water Purification.

Upkeep Problems at St. Louis Filtration Plant. Data on sand growth; removal of mud balls; loose strainer plates; chemical action on equipment; care of hydraulic valves. 2,400 words. Engineering News-Record, Nov. 27-Dec.4, New York.

Reduced Lime Feed Saves Money and Lessens Deposits. Grand Rapids plant now lets hardness rise to Lake Michigan softness, reducing help, wash water and chemicals. 1 chart, 1,000 words. Engineering News-Record, Nov. 27-Dec. 4, New York.

Toronto Drifting Sand Filter Results. Abstract of paper before New England Water Works Ass'n, by N. J. Howard, bacteriologist in charge, water-filtration plant laboratory, Toronto. 2 ills., 1,000 words. Engineering News-Record, Oct. 30-Nov. 6, News York.

Water Filtration in the Tropics. Compilation of records of a slow?sand filtration plant located on one of the Hawaii islands. By S. W. Tay, sanitary engr., Territorial Board of Health, Hawaii. 400 words. Municipal Journal and Public Works, Nov. 8, New York.

Sanitary Effect of aWter Storage in Open Resevoirs. Studies of chemical and bacterial characteristics of water on entering and leaving two reservoirs in Maryland. By A. Wolman and S. T. Powell, of Mryland State Dept. of Health and Baltimore County Water and Electric Co., respectively. 2 ills., 2,000 words. Engineerings News-Record, Oct. 30-Nov. 6, New York.

Prevention and Cure of "Red Water." Effected by removal of oxygen from water; use for this purpose of deactivator and filter. By Wm. H. Walker. Paper before N. E. Water Works Ass'n. 1,000 words. Municipal Journal and Public Works, Nov. 22, New York.

Metering:

Meters Cut Water Consumption of City in Irrigated District. By C. E. Panter, with Tibbets & Pleasant, contractors, Okmulgee, Okla. 1 ill., 600 words. Engineering News-Record, Nov. 27-Dec. 4, New York.

What Meterage Has Done for a New England City. Middletown, Conn., has reduced water consumption from 133 gallons per capita to 78 gallons. 2,000 words. Engineering and Contracting, Nov. 12, Chicago.

Philadelphia Fights Water Waste. Third of series of articles telling of successful campaign on broad lines; Pitot tube most valuable as means of measuring pump discharge; high velocity measurements most difficult; data must be used to be of value. By W. M. Crowe, ass't engr., Philadelphia Bureau of Water. 7 ills., 3,500 words. Fire and Water Engineering, Nov., New York.

Reservoirs and Standpipes:

New 10,000 Gallon Flat Slab Roof Concrete Reservoir at Dayton, O. 2,200 words. Engineering and Contracting, Nov. 12, Chicago.

Structural Features and Erection Methods for 258 Feet High Steel Tower and Tank. 800 words. Engineering and Contracting, Nov. 12, Chicago.

Protecting Standpipes from Corrosion. Editorial reference to paper by C. W. Sherman, at American Water Works Ass'n. 1,000 words. Engineering World, Nov. 1, Chicago.

Painting Iron and Steel Standpipes. Conclusion of author from data collected from cities all over country and from personal experience; thorough cleaning and immediate painting with red lead recommended. By C. W. Sherman, of Metcalf & Eddy. Paper before N. E. Water Works Ass'n. 2,500 words. Editorial, 100 words. Municipal Journal and Public Works, Nov. 1, New York.

Painting Iron and Steel Standpipes. Information from all sections of the country; kind, amount and cost of paint used; preparatory treatment; results. 2 pages tables, 300 words, Nov. 15.

Effect of Water Uplift on Overturning of Dams. Theory advanced that water pressure acting upward replaces portion of foundation reaction and that its overturning effect is annulled by counter movement produced by "remaining foundation reaction"; effect of uplift upon sliding. By E. Maerker, formerly structural engr., Toronto Power Co. 6 ills., 1,000 words. Canadian Engineer, Nov. 6, Toronto, Can.

Measurement of Pressures in Core of Hydraulic Fill Dam. 1 ill., 600 words. Engineering and Contracting, Nov. 19, Chicago.

Summary of Reports on Painting the Interior Surfaces of Standpipes: Continued from Nov. 1 issue. 1½ pages table, 150 words. Municipal Journal and Public Works, Nov. 22, New York.

(*Continued on page 37*)

N. Y. (L. I.), Huntington—Engineer Harold Stevens presented tentative reprot on proposed municipal water plant. It is proposed to build large stand-pipe on high ground at Huntington Station and to utilize present plant as far as possible. Cost of proposed plant $400,000.

N. C., Snow Hill—City will receive bids until Jan. 20 for $60,000 water and sewer bonds.

N. C., Mars Hill—Following decision to erect 150,000-gal. reinf. concr. reservoir in connection with modern water supply system, Mayor J. B. Huff and members of Bd. of Aldermen have purchased supply of piping.

N. D., Fessenden—City plans to build well system and mains in various streets. $50,000.

Okla., Foraker—City voted $40,000 bonds to improve water works system. Engineer not selected.

O., Xenia—Council passed ordinance to issue bonds of $325,000 for purchase and extension of water works system.

O., Greenville—Jan. 15 has been fixed as date for bond issue of $135,000 for improvement of water system.

O., Middlefield—City contemplates construction of water works and pipe line; cost, $30,000. E. Reed, Clerk.

O., Portsmouth—City plans to extend water mains; $30,000. L. A. Zucker, City Auditor.

Ore., Reedsport—City plans construction of municipal water system.

Pa., Bethlehem—City authorizes bond issue of $1,700,000 for water works construction.

Tex., Wichita Falls—Wichita County Water Impvt. Dist. No. 1 will invest $2,750,000 in water system which, will irrigate 100,000 acres in Wichita and Archer Counties. Vernon L. Sullivan, El Paso, Tex., Consulting Engr.

Wash., Walla Walla—Fred G. Wills, City Clerk, informs that election Dec. 16 was carried in favor of issuing $500,000 water system bonds.

W. Va., Clarksburg—J. M. Craddock, Mayor, states that plans are being prepared by Engineers Herriot & McClintock, 170 Broadway, New York, for water works; cost $300,000.

Wis., Kohler—City having preliminary surveys made for water works system; $50,000. J. Donohue, York Bldg., Sheboygan, Engr.

Wis., Cedarburg—City plans to build water works system; $75,000. T. Bechley, Aud.

LIGHTING AND POWER

Ia., Ferguson—Voters authorized purchase electrical equipment and approved issue of $300,000 bonds.

Ia., Maquoketa—Sealed proposals will be received by D. T. Bauman, City Clerk, until Jan. 20, for purchase of $65,000 electric light bonds.

Mich., Arcadia—Village will have electricity; $20,000 circuit will be constructed from Benzie Power Co. on Benzie River.

N. Y., Churchville—City contemplates electric lighting and power system and voted on bonds of $25,000 for construction.

O., Hamilton—Council passed ordinance for $50,000 bonds for improvement and development of city light plant and distribution system. F. J. J. Sloat, Service Dir.

Ore., Bakersfield—The Kern Delta Irrigation Dist. plans construction of $15,000 power plant at Isabella.

S. D., McIntosh—Voters of McIntosh approved proposition for municipal light plant at special election. Plant will be built in spring.

Va., Norfolk—Virginia Railway & Power Co. will spend $1,300,000 during 1920 on improvements to street car and lighting facilities.

B. C., Vancouver—British Columbia Electric Ry. Co. plans extension to gas plant; cost $150,000.

Ont., London—General Manager Buchanan, of Public Utilities Comn., stated that commission stands ready to build supplementary electric power plant the moment city begins new dam across the river. Dam could be erected for $150,000, and it would cost another $100,000 to install power generating plant.

Ont., Fort Metachewan—British syndicate plans power development plant; cost, $250,000. Engineers, Sutcliffe & Neelands, New Liskeard, Ont.

FIRE

Cal., Santa Ana—Fire chief petitioned for new fire house, fire engine and other fire apparatus.

La., Bogalusa—Bond issue of $15,000 has been authorized for fire alarm system. Address City Clerk.

Ia., Decorah—City Council is figuring strongly on purchasing combination fire truck, consisting of hose, ladder and chemical.

Mich., Battle Creek—City may buy new fire alarm telegraph system costing $20,000.

N. J., Cloverdale—Fire Dept. has just been organized and is trying to raise funds for building and equipment. Address Secetary.

O., Hillsboro—Bond election Jan. 27 to submit issue of $9,000 for purchase of new fire truck.

O., Hillsboro—Fire equipment com. of council will make recommendation concerning purchase of new equipment for fire dept.

Pa., Bethlehem—Bond issue of $65,000 for extension and improvement of fire alarm telegraph system and police telephone and signal system is authorized.

Pa., Lewiston—Council proposes to purchase 6 hose carriers, 6 spanners and 500 ft. new fire hose. Address Clerk of Council.

R. I., Woonsocket—Appropriation of $24,000 asked for purchase of motor aerial truck and combination pumper. Address chief of dept.

Wash., Seattle—City Architect Daniel Huntington completed plans for fire station No. 31, a two-story fireproof building. It is proposed to build strucure 48x 27 ft. in area; cost, $20,000.

W. Va., Newell—Council has authorized purchase of 5,000 ft. fire hose to increase efficiency of local dept. It was also decided to repair fire truck.

W. Va., Wheeling—City Manager Chas. O. Epstein has made inspection of fire apparatus in suburban towns and will shortly make report on requirements of these depts.

Wyo., Cheyenne—It was decided to call for bids for new truck to replace one smashed several weeks ago.

BIDS RECEIVED AND CONTRACTS AWARDED.

Pa., Harrisburg—Following bids received by State Hwy. Dept.: Armstrong Co., fabrication and erection complete of superstructure for one deck plate girder hwy. bridge, G. W. Ensign, Inc., Harrisburg, Pa., $12,492.69; Farris Engineering Co., Pittsburgh, Pa., $9,877.57. Berks Co., fabrication and erection complate of through plate girder highway bridge, The O. B. S. Co., Philadelphia, Pa., $31,157.04; The U. G. I. Cont'g Co., Philadelphia, Pa., $41,197.65. Bucks Co., erection complete one through plated girder highway bridge, The C. B. S. Co., Philadelphia, Pa., $24,377,17; G. W. Ensign, Inc., Harrisburg, Pa., $33,665.65. Bucks Co., erection complete of one through plate girder highway bridge, C. B. S. Co., Philadelphia, Pa., $28,560.90; G. F. Ensign, Inc., Harrisburg, Pa., $3,166.80.

BRIDGES

Cal., Chico—Concrete bridge planned over Edgar Slough on Lone Pine Ave. Address M. C. Polk, Co. Rd. Engr. of Butte Co., Oroville.

Cal., Colusa—Bridge over Sacramento River, between Colusa and Glenn Cos., contemplated. Address Co. Clerk.

Man., Headingly—If project is approved by municipalities interested, a $36,000 bridge will be built over Assiniboine River next summer. Structure will be of concrete and wood.

Man., Morris—Engineers are making plans and specifications for bridge across Red River. Cost, $100,000. Provincial Hwy. Comr., A. McGillivray, Parliament Bldgs., Winnipeg.

Mo., Webb City—Special election on bonds for construction of bridges in Jasper Co. will be ordered soon by County Court. Issue will be $250,000.

N. J., Elizabeth—Within a few weeks plans for proposed new bridge over Elizabeth River at South Front St. will be in hands of Co. Engr. Bauer and will be submitted to contractors for bids. Plans being prepared by Haskell Bridge Co., of Philadelphia. Estimated cost, $200,000, covered by a county bond issue.

N. C., Forrest City—City plans to install sewerage system; $25,000. J. B. McCrary Co., Atlanta, Ga., Engrs.

N. C., Wadesboro City—City plans to install sewerage system; $35,000. Blair & Drane, Charlotte, Engrs.

Okla., Oklahoma—State Bd. Health ordered city to build sewage disposal plant; $1,000,000. J. W. Bennett, City Engr.

Okla., Miami—Bridge will be constructed across Neosho River; also other bridges will be improved. Cost, $55,000. George Stein, supervising engr.

O., Youngstown—Cost of Belmont Ave. bridge estimate at $275,000. Ordinance for construction is pending.

Ore., Vale—Malheur Co. and State Hwy. Comn., Portland, having preliminary plans prepared by H. Nunn, State Hwy. Engr., Salem, building bridge over Malheur River.

Pa., Bethlehem—Bond issue of $405,000 for construction of viaduct is authorized.

Pa., Williamsport—Issue of $500,000 bridge bonds voted in Lycoming Co. Address Co. Comptroller.

Va., Petersburg—Engineers of Norfolk and Western and Atlantic Coast Line Railway completed survey for overhead bridge in city. Cost, $350,000.

S. C., Converse—It is planned to spend $45,000 for concr. bridge over Pocolet River. Address J. R. Pennell, State Hwy. Engr., Columbia.

Tex., Orange—Chamber of Commerce ask that sum of $250,000 be set aside to construct proposed steel and concrete bridge across Sabine River at this place.

W. Va., Charleston—City contemplates construction of bridge to cost $300,000. P. J. Walsh, Engr.

Wis., Shawano—Plans being prepared by State Hwy. Comn. for 12 bridges in Shawano Co. W. F. Meyer, Shawano, Co. Hwy. Comr.

Wis., Madison—Wisconsin highway comn. have made surveys and plans for following county aid bridges: Town of Sugar Creek, Brewster bridge, 20x24 ft., reinforced concrete span, with concrete abutments; H. J. Peters, Elkhorn, comr. Town of Parkland, Dutchman's Creek bridge, 16x20 ft., reinforced concrete span, concrete abutments; C. J. Morisset, Superior, Wis., comr. Marquette Co., Meinke bridge, 16x24 ft., reinforced concrete span, concrete abutments; Levi Jones, Endeavor, Wis., comr. Town of Springfield, the Gable bridge, 16x24 ft., reinforced concrete span, concrete abutments; Levi Jones, Endeavor, Wis., comr. Sheboygan Co., 9 reinforced concrete bridges; K. W. Ubbelohde, Sheboygan, comr.

Alta., Banff—Bridge to be erected over Bow River, for which Dominion Govt. has called for tenders, will be reinf. concrete at cost $160,000.

MISCELLANEOUS

Ark., Little Rock—Pulaski Heights property owners will petition City Council to organize new improvement district; cost $40,000.

Conn., Bridgeport—Plans being prepared by J. A. McElroy, City Engr. for concr. bridge over Cedar Creek. Cost, $10,000.

Fla., Pensacola—Passoge of ordinance authorizing issuance of dock and belt line bonds for $400,000 insure dock and

The Municipal Index

Miscellaneous:

A Page from Recent Water Works Reports. Frost penetration in New England in 1917-18. Grouting foundations for dam. How Middletown, Conn., handled frozen meter problem. Thawing fire hydrants with exhaust from truck; borings to determine condition of embankment at Ashokan. Value of soap saved more than cost of water softening in St. Louis. 1,600 words. Engineering and Contracting, Nov. 12, Chicago.

British Water Works Association. 8th annual general meeting held at offices of Metropolitan Water Board, London. 2,300 words. Water and Water Engineering, Nov. 20, London, England.

Pumping Station Undermined by Leaks and Shut Down. Stiff clay honeycombed by rush of water under low head; simple repairs with sheet piles enable early resumption. 3 ills., 600 words. Engineering News-Record, Nov. 27-Dec. 4, New York.

New Water Works System for Phoenix, Ariz. Supply of soft water to be brought a distance of 33 miles and will cost $1,300,000. 700 words. American City, October, New York.

Water Supply Supervision. New York Department of Health by establishing an engineering division has reduced typhoid mortality. Paper before N. E. Water Works Ass'n, by T. Horton, ch. engr., N. Y. State Dept. of Health. 1 ill., 2,300 words. Engineering World, Nov. 15, Chicago.

Water Works for a Small Village. Place of 500 population has spring water pumped to water tank, fire protection and sewerage system. 4 ills., 600 words. Municipal Journal and Public Works, Nov. 1, New York.

Concrete in Water Works Construction. Multiple arch dams; buttress and slab type; reservoirs; concrete pressure pipe; frictional loss in concrete pipe; tanks and standpipes. By A. C. Irwin, engr., Structural Bureau, Portland Cement Ass'n, Chicago. 8 ills., 6,000 words. Municipal and County Engineering, November, Indianapolis, Ind.

Control of New Streets in Relation to Extension of Water Mains. By B. Brewer, ass't engr., State Dept. of Health, Boston, Mass. 1,000 words. Engineering News-Record, Oct. 9, New York.

LIGHTING AND POWER.

Street Lighting:

Modern Systems of Street Lighting Combine Beauty and Utility. By P. Y. Danley. 4 ills., 2,800 words. American City, October, New York.

Unique Lighting System for Saratoga Springs. By A. F. Dickerson. 2 ills., 500 words. American City, November, New York.

Developments in Street Lighting Units. Paper before Convention of Illuminating Engrg. Society, by A. D. Cameron and C. A. B. Halvorson. 2,400 words. Engineering World, Nov. 15, Chicago.

The Principles of Scientific Illumination. From paper at Students' Section of Institution of Electrical Engineers, by G. E. Webb. 350 words. Municipal Engineering and Sanitary Record, Nov. 6, London, Eng.

Hydro-Electric Power:

Queenston-Chippawa Development at Niagara Falls, Ontario. The hydro-electric power commission of Ontario is developing the water power of the province. By H. Gardner. 11 ills., 2,700 words. Engineering World, Nov. 1, Chicago.

New Hydroelectric Power Plant at Rio Pangal, Chile. Construction features of diversion dam, seven-mile pipe line, penstocks and waterwheels for new plant built by the Braden Copper Co., to supply power to its works at Sewell, Chile. By H. L. Cooper. 5 ills., 3,000 words. Electrical Review, Nov. 22, Chicago.

Hydro-Electric Power Development at High Falls. Net head of 80 foot utilized at power site on Mississippi river by Hydro-Electric Power Commission of Ontario; details of dam, intake, gate house, pipe line and power house; surface area method of proportioning materials show excellent results in construction of concrete dam. 15 ills., 1,800 words. Canadian Engineer, Nov. 13, Toronto, Can.

Present Limits of Speed and Output of Single-Shaft Turbogenerators. Importance of rotor dimensions; influence of ventilation, temperature, speed and mechanical forces upon capacity. A.I.E.E. paper by F. D. Newbury, Westinghouse Electric & Mfg. Co., 4 ills., 3,300 words. Electrical Review, Nov. 29, Chicago.

Report on Water Powers of British Columbia. Volume of more than 650 pages, by A. V. White, published by Commission of Conservation; thoroughly covers water legislation, meteorological and topographical data, surveys and maps, stream flow data, bench marks, power sites, present and proposed developments, etc. 3 ills., 5,500 words. Canadian Engineer, Nov. 13, Toronto, Can.

Steam Power:

Limitations and Performances of Large Steam Turbines. Papers presented before New York meeting A.I.E.E.; salient features given in somewhat abridged form. Present Limits of Speed and Power of Single-Shaft Curtis Turbines, by Erskil Berg, Gen. Electric Co. Present Limits of Speed and Power of Single-Shaft Turbines, by J. F. Johnson, Westinghouse Electric & Manufacturing Co. 6 ills., 6,000 words. Electrical Review, Nov. 22, Chicago.

Pulverized Coal Under Boilers. Relative theoretical performance of stoker-fired and pulverized coal; comparative costs. Abstract of paper by F. A. Scheffler and H. G. Barnhurst. 4 ills., 2 tables, 3,800 words. Electrical Review, Nov. 15, Chicago.

Rates:

Central-Station Rates in Theory and Practice. (17th article.) Rates based on demand; flat rates for display lighting and small consumers; advantages of flat rate; theory of rates based on energy and demand. 6,000 words, Nov. 1. (18th article.) Rates based on both energy and demand; time interval of maximum demand, how demand is determined and other details; power-factor; demand measuring instruments. 5,500 words. Nov. 8. (19th article.) Combined energy and demand rates; substitutes for measured demand; encouraging use of appliances; Hopkinson, Doherty and Wright rate systems; combination rates. 7,000 words, Nov. 15. (20th article.) Arithmetical and algebraic analysis of rate schedules; making seemingly involved rates simple; calculations simplified and basic errors exposed. 3,300 words, Nov. 22. (21st article.) Geometrical analysis of rate schedules; principles, of three-dimensional representations of rates; typical examples using solid models. 19 ills., 3,200 words, Nov. 29. By H. E. Eisenmenger. Electrical Review, Chicago.

Gas:

Regulation for High and Low Pressure Mains. Experience in regulating pressures from transmission or pumping mains into distribution mains discussed in an A.G.A. paper. By G. T. Macbeth, Mt. Vernon, N. Y., 3 ills., 3,000 words. Gas Age, Nov. 15, New York.

Cast Iron Pipe Joint Tests Made at Schenectady. Results of investigations conducted by Mohawk Edison Co. upon various types of joints for gas mains. By V. Starzenski, Schenectady, N. Y. 21 ills., 1,500 words. Gas Age, Nov. 1, New York.

American Gas Association Annual Meeting. Notes upon proceedings of first annual convention held in Hotel Pennsylvania, N. Y. C., with brief abstract of discussion and speeches at banquet. 2 ills., 13,000 words. Gas Age, Nov. 1, New York.

Fixing of Blame for a Gas Explosion. Legal decisions pointing out whether there is a presumption of negligence where an explosion of gas occurs. By J. Simpson, N. Y. C. 1,800 words. Gas Age, Nov. 15, New York.

Miscellaneous:

Value of Statistics in Central-Station Operation. Manifold uses of statistical data; how they should be used; methods of organizing and maintaining the work of compiling essential statistics for the central station. By E. J. Fowler, statistician, Commonwealth Edison Co., Chicago. 3 ills., 2,300 words. Electrical Review, Nov. 22, Chicago.

Discussion of Code Rules on High-Potential Systems. Comments on relation of present rules to developments in field practice, with suggestions for proposed changes. Paper before National Ass'n of Electrical Inspectors, by G. S. Lawler, electrical engr. 2,500 words. Electrical Review, Nov. 15, Chicago.

Illinois State Electric Association Has Profitable Meeting. Central-station representatives at Chicago convention hear and discuss papers on many subjects vital to industry. 2,500 words. Electrical Review, Nov. 1, Chicago.

FIRE.

Municipal Electric Fire-Alarm and Police Patrol Signaling Systems. 1 ill., 1,500 words. American City, November, New York.

New Sprinkler Fire Alarm. An automatic system for prevention and location of fires in buildings and ships; can also be operated manually through concealed electric element; controls fire doors or curtains; ingeniously designed annunciator. 2 ills., 800 words. Fire and Water Engineering, November, New York.

Private Fire Protection Service. Excerpts from final report of committee on private fire protection service of American Water Works Association; methods to prevent pollution; who should bear cost? (Continued.) 6 ills., 3,800 words. Fire and Water Engineering, November, New York.

New York Fire College Course. Hydraulics in the fire service; friction rules; table of friction losses as set forth by N. Y. Fire Department; formulas for friction loss; to find engine or nozzle pressure; pressure loss in Siamese connections. 4,000 words. Fire and Water Engineering, November, New York.

STREET CLEANING AND REFUSE DISPOSAL.

Snow Removal Plans and Procedure. As reported by several highway departments in northern states. 3,500 words. Municipal and County Engineering, November, Indianapolis, Ind.

Savings Made by Motorizing Street Cleaning Equipment. At Albany, N. Y., horse sweepers transformed by attaching Ford tractors; truck used with sanding device; power flusher remodeled. 2 ills., 1,000 words. Engineering News-Record, October, New York.

Refuse Dumping at Oakland. 2 ills., 150 words. Municipal Journal and Public Works, Nov. 8, New York.

Pig Feeding for Disposal of Garbage. Results obtained at experimental farm operated by the District of Columbia, and conclusions therefrom; selection of stock; protection from disease; housing and feeding; costs and profits. By F. S. Besson, Capt., Corps of Engrs., U. S. A. 4 ills., 3,400 words. Municipal Journal and Public Works, Nov. 22, New York.

Newark, N. J., Contracts for Garbage Disposal. By new contract city collects and delivers garbage to piggery. By J. W. Costello, engrg. supervisor, Bureau of Street Cleaning and Refuse Collection, Newark. 600 words. American City, October, New York.

Garbage Collection and Disposal at Utica. Pickup made by trucks with trailers; disposal by feeding to hogs and sheep; methods employed; cost of operation. 3 ills., 2 tables, 1,500 words. Engineering News-Record, Oct. 30-Nov. 6, New York.

Recovery of Valuable Constituents of Garbage. Summary of various methods of disposal of municipal wastes, including hog-feeding, incineration, sorting, reduction, alcohol production, etc. Paper before American Society for Municipal Improvements, by S. A. Greeley, consultg. engr., Chicago. 5 tables, 3,500 words. Canadian Engineer, Nov. 27, Toronto, Can.

CITY PLANNING.

Oregon's New City Planning Laws. By G. C. Moser, state senator, Portland. 700 words. American City, October, New York.

Town Planning, with Special Reference to Ottawa. Planning and production go hand in hand; problems of highway and railway; some notes on present and future problems of capital. By N. Cauchon, consultg. engr. and town planner, Ottawa. 4,000 words. Nov. 13. Dominion park near Ottawa; scenery for railway passengers; reducing the home's overhead; residential and industrial city. 3,000 words, Nov. 20. Canadian Engineer, Toronto, Ont.

The Planning of Land in Relation to Municipal and Social Problems. National and provincial plans; need for topographical maps; regional and town planning. By T. Adams, town planning

(Continued on page 40.)

belt railroad and municipal dock. Work to obtain these necessities will proceed rapidly, and plans have already been made.

Ia., Des Moines—City soon receives bids for excavation 150,000 yds.; cost $100,000. F. Jeffries, City Clerk.

Ia., Manchester—Delaware Co. having lans prepared building 168-ft. reinf. concr. bridge, $40,000. H. Klaus, Co. Engr.

La., New Orleans—City nursery, botanical garden and breathing spot will result in purchase of 60 acres on Gentilly Rd. Property was acquired by city parking comn., $40,000. Development of the tract, an area of 1,200 ft., will be begun immediately, according to Col. George McDerby.

N. Y., Albany—State land board authorized comptroller to sell $2,500,000 bonds to purchase Mt. Marcy and land surrounding it which is to become a park.

N. Y., Yonkers—Ordinance authorizing sum $25,000 for motorization of dept. of pub. works was passed by council. It is purposed to purchase 19 autos.

Ore., Klamath Falls—Klamath Irrigation Dist. will be asked to authorize expenditure of $175,000 for construction work.

Tex., Galveston—Bids soon to be received for purchase of two motor trucks for health dept.

Tex., Corpus Christi—City Comrs. contemplate construction of sea wall, 600 ft. long. Cost, $2,900,000. C. J. Howard, City Engr.

Wash., Seattle—K. L. Goulter & Co., Seaview, Wash., who secured state contract for clearing, grubbing and draining six miles of Ocean Beach highway between Bear River and Nasel, Pacific Co., on unit bid amounting to $192,000, wants bids for removal of 150,000 yards of rock and earth.

Wash., Seattle—City Council considers $750,000 issue of bonds for purpose of improving city's park, playfield and boulevard system.

Wis., Shawano—Shawano Co. appropriated $10,000 for purchase of machinery, including 8 graders. W. F. Meyer, Shawano, Comr. Also Washington Co. Bd. appropriated $13,000 for purchase of road machinery. Chas. Johnson, Kewashum, Wis., Comr..

Ont., Sarnia—By-law to raise $35,000 for purchase of asphalt plant and equipment will be submitted to ratepayers at municipal elections. City Clerk, J. D. Stewart.

BIDS RECEIVED AND CONTRACTS AWARDED.

Mo., Kansas City—Board of fire and water comrs. opened bids for 775 tons of cast iron pipe. Four bids were received. Low bidder was American Cast Iron Pipe Co., of Kansas City, $67.60 a ton, delivery in 90 days. All bids referred to engineering dept. for recommendation.

N. Y., Albany—State hospital comn. opened bids for erection of addition to laundry building at Brooklyn State Hospital. Lowest bid, $40,800, was submitted by New York firm, McCann Building Co. of Albany being next with bid $47,653. W. B. Armstrong Co. of Albany entered bid $4,385 for heating work, third lowest on list. Same concern stands lowest for plumbing work with offer $6,288. Morris Kantrowitz, of Albany, was only bidder for construction work at Manhattan State Hospital. Offer was $137,800.

TOO LATE FOR CLASSIFICATION

STREETS AND ROADS.

Ark., Morrilton—Road Dist. No. 2, in Conway Co., have awarded bonds of $150,000.

Cal., Sacramento—1920 road building program of State Highway Comn. provides for average monthly expenditure of $1,000,000.

Ill., Decatur—Between 8 and 9 mi. of pavements are proposed at estimated cost of $800,000.

Mich., Ionia—Ionia Co. contemplates paving costing $142,860. D. C. Crawford, Hwy. Comr.

Minn., St. Paul—South St. Paul is contemplating continuation of Concord St. pavement to Inver Grove, and Dakota Co. plans grading of river highway to Hastings next year. Board probably will advertise for bids in Feb. Ramsey officials assured Dakota Co. Bd. that if they proceed with grading Ramsey Co. will include in its budget for 1921 "substantial aid" for converting highway into permanent road. Necessity to promote early completion of pavement on South Smith Ave., St. Paul, was discussed. It will be necessary to pave 3,000 ft. Hennepin Co. is providing funds to carry on road and bridge work. In addition to fund of $440,000 in the budget, county authorized bond issue of $286,000 in May, $125,000 in June and $400,000 worth of bridge bonds in Sept.

Mont., Billings—Yellowstone Co. Bids in Jan. 9, 1920, for $250,000 hard surface road bonds. Balance of $75,000 from former bond issue will make $275,000. Federal aid money for 150 mi. of roads. C. E. Durland, Co. Surv.

Mo., Marshall—Saline Co. will shortly vote on $1,500,000 road bonds.

N. C., Buncombe—$450,000 road and bridge bonds were awarded Battery Park Bank, Asheville.

N. C., Charlotte—$600,000 hard surface all weather road between Charlotte and Davidson to be known as Wilson Blvd., is being planned by Col. T. L. Kirkpatrick. Road will extend distance of 25 mi. Will have 5-ft. concrete base and be 25 ft. wide.

O., Canton—Road program for Stark Co. calls for improvement of 32 mi. of roadway. New work will cost $1,000,000. Every town in county will be inculded. Plans now being prepared by Co. Engr.

Okla., Sapulpa—Creek Co. voted $1,000,000 road bonds.

Ore., Eugene—Lane Co. in favor of bond issue of $2,000,000 for roads.

Tenn., Dover—Stewart Co. has voted $200,000 road bonds.

Tex., Dallas—Oak Cliff traffic will be facilitated by widening and opening of Davis St. to uniform width 60 ft. Total cost of this improvement $13,627. Geo. D. Fairtrace, City Engr., estimated.

Tex., Del Rio—Returns from Valverde Co. in election show that good roads bonds election of $400,000 carried.

Tex., Gainesville—Proposition has been suggested to building concrete road from here to Sherman instead of proposed interurban railway. Subject will be thoroughly investigated before final action is taken.

Tex., Kenedy—Sealed bids received Feb. 18, 1920, on $300,000 bond issue for road improvements in Kenedy dist., Karnes Co. J. H. Stoltzfus, Secy., Kenedy, Tex.

W. Va., Beckley—Raleigh Co. voted $147,000 bonds to grade and drain Clear Fork Rd.

Wis., Hillsboro—Jefferson Co. will spend $38,357 for road work in 1920. Grading and surfacing of ten roads is planned.

Wis., Green Lake—Green Lake Co. adopted road building program for 1920 costing $25,661.16. This includes building of two bridges: Ruske bridge, $914; Reimer bridge, $988. D. C. Williams, Green Lake, Wis., Comr.

Wis., Madison—Tentative list of roads to be constructed in 1920 has been issued by Comr. of Highways. Plans are now in preparation and work will be advertised and contracts awarded January to April. Work totals 1,805 mi. of grading, 1,530 mi. of graveling, and 132 mi. of paving.

Wis., Medford—Taylor Co. plan county and state aid program for 1920, which includes grading and draining 3 roads at cost $15,892.83. Ford Grahl, Medford, Wis., Comr.

Wis., Milwaukee—Milwaukee Co. has $380,505.48 available for 1920 county and state aid highway construction program. W. F. Cavanaugh, Pereles Bldg., Milwaukee, Wis., Comr.

Wis., Sheboygan—Sheboygan Co. plans road program for 1920 requiring $87,619.20 for building 17 roads. Geo. W. Ubbelohde, Sheboygan, Comr.

Wis., Sturgeon Bay—Door Co. appropriated $25,243.85 for surfacing 9 roads, macadam and gravel to be used. J. M. Laurie, Sturgeon Bay, Comr.

Wis., Waupaca—Waupaca Co. plans road building program for 1920 requiring $37,698.05 for grading and garvel surfacing 9 roads. Chas J. Knudson, Clintonville, Wis.

BIDS RECEIVED AND CONTRACTS AWARDED.

Tex., San Angelo—Contracts let by Tom Green Co. Comrs. to former Representatives Charles B. Metcalfe and J. E. Ward of Dallas provide for completion of Sonora Rd., southward 26 mi. Total cost, including grading and concrete contracts let some time ago, $302,000.

SEWERAGE.

Ill., East Alton—Construction of sewer system is contemplated, $125,000. J. Cruse, Pres., Bd. of Local Impvts.

Md., Westminster—Survey being made for sewer system. H. E. Koonty, Mayor.

Mass., Boston—Comr. of Public Works states that it is his intention to construct sanitary sewer 2 ft. 6 in. by 2 ft. 6 in. concrete and 2 catch basins and connections in Oswego St., city proper, at cost $12,575.

Okla., Gadsden—City will vote Jan. 6 on sewer bonds of $90,000.

Wis., Campbellsport—Election for bond issue of $15,000 for installing sewerage system, carried.

BIDS RECEIVED AND CONTRACTS AWARDED.

O., Canton—Contract for construction of storm sewers in 15th St., Wise Bros., of Canton, at $5,807. Contract for motor tractor to be used in service dept. was given T. J. Tractor Co., of Cleveland, at $2,800. Rensselaer Co., of Cleveland, was given contract for valves for use in water works dept. for $5,619.

WATER SUPPLY.

Cal., Porterville—South Tule Independent Ditch Co. propose construction of storage reservoir at mouth of Success Valley; cost, $70,000.

Ga., Leslie—Leslie will shortly vote on water and sewer bond issues. J. J. Jones, City Clerk.

Ind., Boonville—Efforts are being made by City Council to obtain pumping station to be owned and governed by city authorities. Petition for loan of $20,000 will be considered, which will be used for building pumping station.

Mont., Great Falls—W. H. Harrison, City Clerk, desires bids until Jan. 12 for purchase of bonds of $225,000, money to be used in acquiring additional water facilities.

Mo., Webb City—Bonds voted for water works to cost $300,000. L. O. Walker, City Clerk.

Okla., Eufaula—City voted $25,000 bonds to extend water works system.

Okla., Madill—Madill will vote Jan. 15 on $400,000 water bonds.

S. C., Edgefield—Plans being prepared for water system. Address J. G. Edwards, Mayor.

BIDS RECEIVED AND CONTRACTS AWARDED.

(*Indicates Contracts Awarded.)

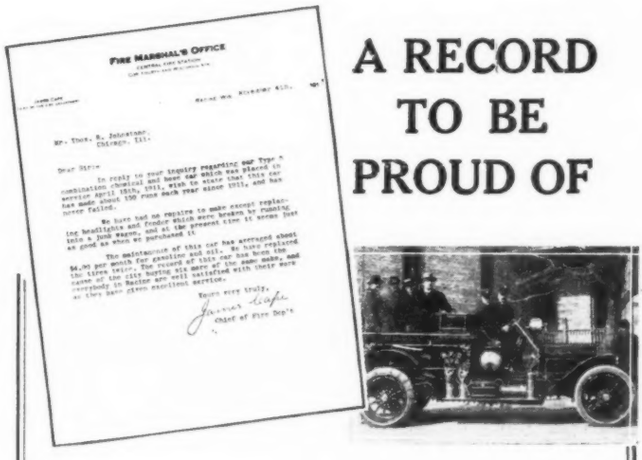
***O., Canton**—Contracts for McKinley Ave. storm sewer and Portage St. water main extension were awarded Peter Christiansen, of Canton. To Tony Marcello was awarded contract for Howard St. sanitary sewer. Dominic Nicholis, of Canton, was awarded contract for installation of sanitary sewers in Portage St., Bachtel Ave. and Cole Ave. Work will be commenced in early spring.

LIGHTING AND POWER.

Ind., Decatur—Decatur has authorized $140,000 electric light power plant bonds.

Okla., Gadsden—City will vote Jan. 6 on bond issue of $100,000 for light plant.

Ore., Roseburg—In opinion of Assistant State Engr. C. E. Strickland, the North Umpqua River is the best power stream in state. Engineer Strickland has been assisting city in locating power site for proposed municipal light and water system.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Mr. Thos. E. Johnstone,
Chicago, Ill.

Dear Sirs:

In reply to your inquiry regarding our Type "
combination chemical and hose car which was placed in
service April 15th, 1911, wish to state that this car
has made about 150 runs each year since 1911, and has
never failed.

We have had no repairs to make except replac-
ing headlights and fender which were broken by running
into a junk wagon, and at the present time it seems just
as good as when we purchased it.

The maintenance of this car has averaged about
$4.00 per month for gasoline and oil. We have replaced
the tires twice. The record of this car has been the
same of the six buring six more of the same make, and
everybody in Racine are well satisfied with their work
as they have given excellent service.

Yours very truly,

Chief of Fire Dep't

A RECORD TO BE PROUD OF

NEARLY nine years in active service is a record to be proud of. We can point to similar performances by American-La France Motor Apparatus all over the country.

NOTHING TALKS LIKE ACTUAL PERFORMANCE

AMERICAN-LAFRANCE FIRE ENGINE COMPANY, INC.

ELMIRA, N. Y.

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adviser to Dominion Cabinet. 4,000 words. Canadian Engineer, Nov. 20, Toronto, Can.

Housing and Town Planning. Address at Ottawa conference of American City Planning Institute and Town Planning Institute of Canada, by Thos. Adams, town planning adviser to Dominion Cabinet. 3 ills., 3,500 words. Canadian Engineer, Nov. 6, Toronto, Can.

The Proposed City Plan of Winnetka, Ill. Relocating tracks; establishing motor highways; districting. By E. H. Bennett, consultg. archt., Chicago. 3 ills., 1,000 words. American City, October, New York.

Paris Proves the Wisdom of City Planning. 500 words. Engineering and Contracting, Nov. 5, Chicago.

Zones:

Building Zones for Newark. Commission on building districts and restrictions reports complete plan for zoning with proposed ordinance; use, height and area districts; some unusual features. 2 ills., 3,200 words, Nov. 15. Regulations for area districts; rear yards; building lines; regulating existing buildings; board of appeals. 1 ill., 2,800 words, Nov. 22. Municipal Journal and Public Works, New York.

The Legality of Zoning Regulations. Court decisions hold that a city's expansion and growth are superior to whims of a few capricious landowners. By H. S. Swan, executive secy., Zoning Committee, N. Y. C. 1,700 words. American City, November, New York.

Zoning System for Chicago. Investigation and report. 4,300 words. Engineering World, Nov. 1, Chicago.

Money Value of Light and Air. Editorial comment on value of property being lowered disastrously by overshadowing buildings, in year or two after construction. 250 words. Municipal Journal and Public Works, Nov. 15, New York.

Streets and Lots:

Rules for the Establishment of Street Widths and Their Subdivisions. Report at American City Planning Institute and Town Planning Institute of Canada, by B. A. Haldeman, advisory engr., Zoning Commission, Philadelphia. 1,000 words. Engineering and Contracting, Nov. 5, Chicago.

Effects of Size of Lots on Cost of Industrial Housing. A study of yard frontages and depths in relation to outlays for utilities, streets and sidewalks; possible economics. By Morris Knowles, consltg. engr., Pittsburgh, Pa. 2 tables, 1,000 words. Engineering News-Record, Nov. 27-Dec. 4, New York.

Effect of Size on Residence Lot on Cost of Street Improvements and Utilities. By Morris Knowles, consltg. engr., Pittsburgh, Pa. 1,600 words. Engineering and Contracting, Nov. 5, Chicago.

A Successful Public Market in a Small Town. By Wm. B. Hatch. 3 ills., 1,600 words. American City, November, New York.

GOVERNMENT AND FINANCE.

Selling Good City Government. Outlining development of a definite program of constructive publicity on commission-manager government in Kalamazoo, Mich., during its first year of operation. By H. H. Freeman, city manager, Kalamazoo. 2 ills., 2,000 words. American City, October, New York.

Pittsburgh's Graded Tax Law and Its Results to Date. By Wm. McNair. 400 words. American City, November, New York.

What Cities Earn and Spend. Public service enterprises earned nearly double total of liquor taxes. 600 words. American City, November, New York.

The Municipal Bond Market. October set new record. 200 words. Municipal Journal and Public Works, Nov. 1, New York.

Teach the Average Man to Invest in Public Works Bonds. Editorial. 900 words. Engineering and Contracting, Nov. 5, Chicago.

STRUCTURES AND MATERIALS.

Bridges:

Diagrams for Reactions and Bending Moments of Beams. By R. Burnham, consltg. and designing engr., Chicago. 6 diagrams, 300 words. Engineering News-Record, Nov. 27-Dec. 4, New York.

Broader Use of Johnson's Formula for Repeated Stresses. By J. B. Kommers, ass't prof. of mechanics, University of Wisconsin, Madison. 1 chart, 4 tables, 2,000 words. Engineering News-Record, Nov. 27-Dec. 4, New York.

Wide Bridge Built as Two Bridges Without Interval. Novel materials plant derricks designed to meet local restrictions; industrial railway distributed concrete. 5 ills., 1,200 words. Engineering News-Record, Nov. 27-Dec. 4, New York.

Arch Bridge with Ribs Anchored by Concrete Keys. Design for concrete viaduct at Rocky Point, Ore., has 113-foot arch span; steel rib rods embedded at abutments. By C. B. McCullough, bridge engr., Oregon State Highway Comm., Salem. 1 ill., 500 words. Engineering News-Record, Nov. 27-Dec. 4, New York.

Choose Wilmington Bridge Engineer by Competition. Five engineers asked to submit designs for new $500,000 memorial structure; each one paid $500. 1 ill., 1,000 words. Engineering News-Record, Oct. 30-Nov. 6, New York.

Niagara Railway Arch Reinforced for Heaviest Traffic. Capacity increased to meet increasing traffic demands; stresses in 550-foot arch span redistributed by changing crown shims; floor reconstructed for E70 loading; bracing and reinforcement. 4 ills., 4,000 words. Engineering News-Record, Nov. 13-20, New York.

New Type of Wood and Asphalt Flooring for Chicago Bridges. Transverse planks on edge form surface grooves, to hold asphalt surfacing; light weight and low cost. By F. H. Avery, engr. of Bridge Constr. and Repair. Dept. of Public Works, Chicago. 1 ill., 1,300 words. Engineering News-Record, Nov. 13-20, New York.

Breaking Up a Concrete Bridge, 200 words. Municipal Journal and Public Works, Nov. 1, New York.

Highway Bridges. Concrete masonry construction employed in building most bridges in Western states, following lead of railroad companies. 600 words. Municipal Journal and Public Works, Nov. 1, New York.

Bridge Engineering in Active Warfare. Civilian bridge-design methods applied in work of A. E. F. unprecedented loadings; traffic conditions; new types of bridge developed; reinforced pontoons; sectional steel bridges. Flooring, loads, impact and unit stresses. By L. E. Moore and M. W. McDonald, formerly Engrs., U. S. A. 22 ills., 4,300 words. Editorial reference to above article. 1,200 words. Engineering News-Record, Oct. 9. 22 ills., 4,700 words, Oct. 16, New York.

Bridge Approaches. Abstract of interesting discussion in August-September "Public Roads." 2 ills., 700 words. Engineering and Contracting, Nov. 5, Chicago.

What of the Public Safety in Pittsburgh? Editorial reference to turning over to architectural firms the work of designing and supervising several new bridges over the Allegheny river. 1,200 words. Engineering News-Record, Oct. 9, New York.

Other Structures:

Earth Slides in Winnipeg Aqueduct Construction. Description of the principal methods used by contractors in dealing with the sloughs and slides; bearing tests demonstrated instability of the soft dark clay, analysis of which showed 15% of moisture and water of combination. By D. L. McLean, formerly div. engr., Greater Winnipeg Water Dist. 7 ills., 1,200 words. Canadian Engineer, Nov. 20, Toronto, Can.

Factors in Design of Sluices and Pipe Lines for Hydraulicking. Graphical representation of formulae used in designing hydraulic pipe lines. By F. A. Goodale. 2 ills., 1,000 words. Engineering and Contracting, Nov. 19, Chicago.

Determination of Kutter's Roughness in a Drainage Ditch. Field and office work described and conclusions drawn; results indicate too low a value formerly used. By R. Bosard, with Morgan Engrg. Co., Memphis, Tenn. 5 ills., 1,300 words. Engineering News-Record, Nov. 27-Dec. 4, New York.

New Type of Thin-Wall Cofferdam. Combined steel and timber piles form sectional design, giving low-cost, stiffness and water-tightness. 4 ills., 500 words. Engineering News-Record, Oct. 30-Nov. 6, New York.

Lowering a 400-Ton Dock Caisson Gate With Sand Jacks. Tests on manipulation of sand jacks led to their use in placing gate to Navy's Puget Sound shipbuilding dock. By G. W. Plaisted, lieut., Corps Civ. Engrs., U. S. N., Puget Sound, Wash. 8 ills., 3,400 words. Engineering News-Record, Nov. 13-20, New York.

Discharge Co-efficients for Canal Head Gates. Observations made at the Whalen head gates on the North Platte project and at the Sunnyside on the Yakima. By J. S. Longwell and J. Hinds engrs., U. S. Reclamation Service. 5 ills., 1 table, 3,000 words. Engineering World, Nov. 1, Chicago. Engineering and Contracting, Nov. 12, Chicago.

Floodgates Proposed for Control of Savannah River. Movable dam at mouth of unused channel would permit concentration of ebb to scour the main ship channel. By E. C. Garvin, Brunswick, Ga., formerly with U. S. Engr. Dept., Savannah. 1 ill., 2 tables, 2,000 words. Engineering News-Record, Nov. 13-20, New York.

Pearl Harbor Dry Dock Pump Well Large Precast Unit. Base of concrete box 96 by 45 feet in plan and 60 feet deep cast on float; upper part poured in attached cofferdam. By R. W. Gaylord, ass't engr., San Francisco Bridge Co., on Pearly Harbor Dry Dock, Honolulu, H. I. 5 ills., 2,000 words. Engineering News-Record, Nov. 13-20, New York.

Pile Foundations for Unequal Load Distribution. Design based upon analysis to insure that each pile will sustain same total safe load by proper spacing. By E. Arneson, irrigation and structural engr., Washington, D. C., 2 ills., 500 words. Engineering News-Record, Oct. 9, New York.

Making Interlocking Steel Piling Watertight. By W. T. Christine. 1 ill., 1,500 words. Engineering World, Nov. 15, Chicago.

Concrete Construction in Cold Weather. Precautions to be used and methods to be employed to insure satisfactory results; some valuable suggestions. 6 ills., 2,700 words. The Modern City, November, Baltimore, Md.

New York Vehicular Tunnel Lining. Proposed to use concrete block, as in Detroit and Montreal. By J. F. Springer. 5 ills., 3,200 words. Engineering World, Nov. 1, Chicago.

Prices of Building Materials, 1914-1919. Diagram indicating price changes in building materials during 1914-1919. Data collected and plotted by U. S. Housing Corporation. Engineering News-Record, Oct. 30-Nov. 6, New York.

Reinforced Concrete Fuel Oil Reservoirs. Paper before American Concrete Institute, by H. B. Andrews, industrial engr., Springfield, Mass. 1 ill., 2,500 words. Engineering World, Nov 1, Chicago.

Concrete:

Analysis of Concrete-Proportioning Theories. Data upon which Abrams' fineness modulus and Edwards' surface area methods are based show validity of water-cement ratio theory and demonstrate that fineness modulus varies with surface area; tests all agree but interpretations differ. By R. B. Young, engrg. materials laboratory, Hydro-Electric Power Comn. of Ontario. 12 charts, 3,000 words. Canadian Engineer, Nov. 27, Toronto, Can.

Effect of Rodding Concrete. Letter to editor from Duff A. Abrams, prof.-in-charge, Structural Materials Research Laboratory, Lewis Institute, pointing out error in Prof. F. E. Giesecke's tests on rodded concrete. 1,000 words. Canadian Engineer, Nov. 27, Toronto, Can.

Concrete and Its Application to Municipal Work. Stains on concrete floors; cement joints for water pipes, cracks in concrete; painting concrete surfaces, 1,000 words. Municipal Engineering and Sanitary Reord, Nov. 13, London, Eng.

Conrete Substitutes for Stone. A plea for use of natural stone. Letter from S. McPherson, Quarry Mgrs. Ass'n, Clynnog, North Wales. 500 words. Municipal Engineering and Sanitary Record, Nov. 13, London, Eng.

Experiments Show Effect of Fineness of Cement. Results of over 6,000 tests of concrete cylinders, 9,000 compression and tension tests of mortar, and several thousand miscellaneous tests; summary of paper before American Society for Testing Materials, by Duff A. Abrams, prof.-in-charge, Structural Materials Research Laboratory, Lewis Institute, Chicago. 1,200 words. Canadian Engineer, Nov. 6, Toronto, Can.

Water-Ratio as Affected by Rodding.

(*Continued on page* 42.)

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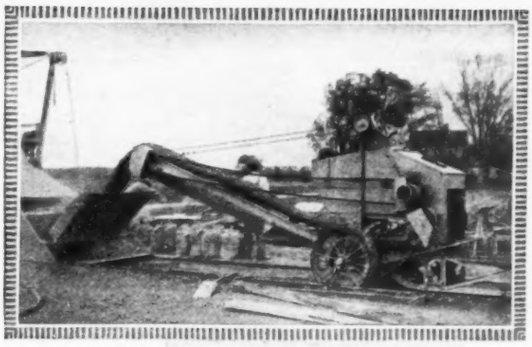

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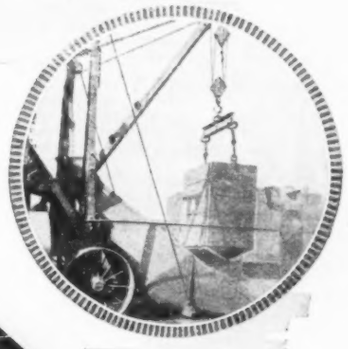

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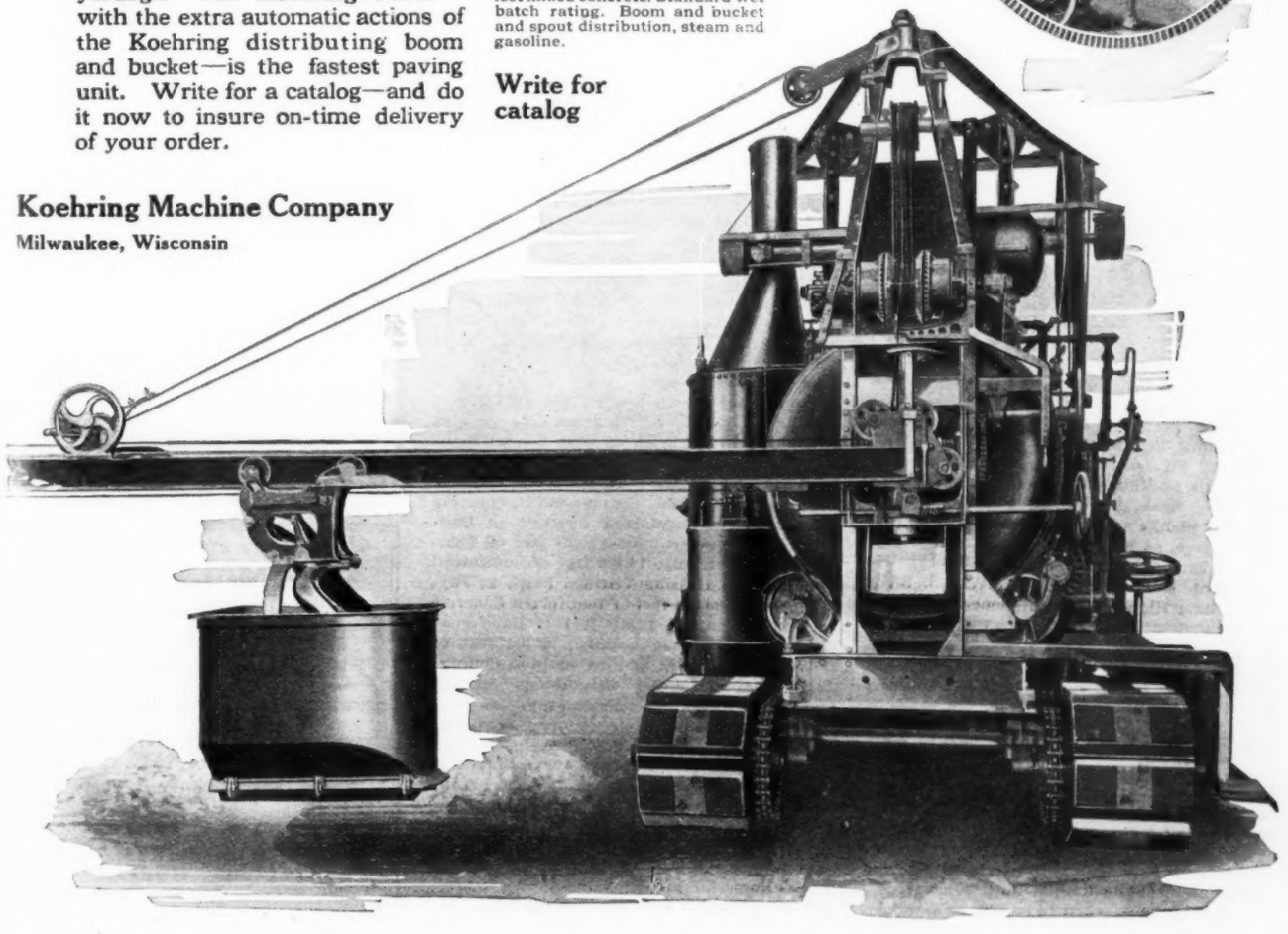

The Municipal Index

Letter referring to Prof. F. E. Giesecke's tests on rodded concrete, from D. A. Abrams, prof.-in-charge, structural materials research laboratory, Lewis Institute, Chicago. 1,200 words. Engineering News-Record, Nov. 13-20, New York.

Burnt-Clay Aggregate and Wood Reinforced Concrete. Results of investigations in British Guiana. 400 words. Engineering News-Record, Oct. 9, New York.

MISCELLANEOUS.

Contracts—A Comparison of "Cost Plus" With Other Forms. Use during past few years of "cost-plus" form on very large and complicated construction work seems to render time opportune for general discussion of advantages and disadvantages of this type. By E. W. Clarke, M.Am.Soc.C.E. 2,800 words. Engineering World, Nov. 15, Chicago.

Financial Statements an Aid in Procuring Contracts. From "Successful Methods," by D. J. Hauer, construction economist. 1,000 words. Canadian Engineer, Nov. 6, Toronto, Can.

H. W. Nelson's Plan of Payment for Estimating. Rules and procedure whereby each project is considered separately; fundamentals to be observed in estimating; statements by Mr. Nelson to Committee on Methods of Associated General Contractors of America. 4,800 words. Canadian Engineer, Nov. 6, Toronto, Can.

The Contractor's Salary as "Overhead." Excerpts from address before Seattle Master Builders' Ass'n, by J. F. Lidral of Arvesen & Lidral, Seattle. 1,200 words. Canadian Engineer, Nov. 20, Toronto, Can.

Demonstration Truck Tour. Trip through agricultural states made by 18 trucks and 80 men to demonstrate value for hauling and other farm work. 2 ills., 600 words. Good Roads, Nov. 5, New York.

The Motor Bus for City Service. Transportation must keep pace with the growth of the community. 2 ills., 1,300 words. American City, November, New York.

"Economic Limits of Motor Truck Weights." Letter from J. W. Pearl, Chicago, commenting on article under this title by R. C. Barnett, Kansas City, in issue of Oct. 1, and answer from the author. 1,300 words. Engineering and Contracting, Nov. 5, Chicago.

Templet Used in Clearing Sand from Irrigation Canals. Winds blow 60,000 cubic yards into ditches; draglines, plows and iron sheaves used before templet proves worth. 1,500 words. Engineering News-Record, Oct. 30-Nov. 6, New York.

Removal of Sand from Irrigation Canal by Sluicing. 1 ill., 1,300 words. Engineering and Contracting, Nov. 12, Chicago.

Land Values Raised by Drainage. Engineer cites cases where drained lands sell at $200 and $300, while former value was $10 to $20 per acre. 500 words. Engineering News-Record, Nov. 13-20, New York.

Suggestions for Reducing Waste of Irrigation Water. 2,800 words. Engineering and Contracting, Nov. 12, Chicago.

Reclamation by Drainage of Land in Mississippi Valley. By E. T. Perkins, pres., Natl. Drainage Congress, Chicago. 5 ills., 2,500 words. Municipal and County Engineering, November, Indianapolis, Ind.

Irrigation in the 14th Census of the United States. Nature and extent of works, capital, operating and cost figures, water used, drainage and water rights covered. By R. P. Teele, special agt. in charge of irrigation, Bureau of Census, Washington, D. C. 2,400 words. Engineering News-Record, Nov. 27-Dec. 4, New York.

Engineers Resent 1916 Basis for 1919 Salaries. Made by the accounting firm of Arthur Young & Co., of Chicago, Toronto and New York. 1,400 words. Engineering and Contracting, Nov. 5, Chicago.

Changes in the Value of the Dollar. With relation to wages, salaries and prices. 1 chart, 2,600 words. Engineering News-Record, Nov. 27-Dec. 4, New York.

Cincinnati Civic and Vocational League. An organization which teaches civics as a living social experience. By Irene D. Cornwell, director of Civic and Vocational League, Cincinnati Public Schools. 1 ill., 2,000 words. American City, November, New York.

The Community Forum and the Chamber of Commerce. Clearing house of ideas. By A. Lyle De Jarnette, pres., American Forum Ass'n. 1,300 words. American City, October, New York.

Public Abattoirs. Of 1,400 municipalities investigated by American Public Health Association, only 195 had meat inspection of any kind. 400 words. Municipal Journal and Public Works, Nov. 1, New York.

Wire Ropes in Contract Work. Suggestions for prolonging their life and avoiding accidents; making socket and clamp joints. 1,700 words. Municipal Journal and Public Works, Nov. 8, New York.

American Society for Municipal Improvement Convention. Narrative of the doings of the society at New Orleans convention; reports of secretary, treasurer and committees; papers and discussions; exhibits; no changes in specifications. 2,000 words. Municipal Journal and Public Works, Nov. 8, New York.

Wind as Motive Power. Notes on windmills for pumping sewage and water. Factors governing size of wind engines; wind engine gearing. 2,700 words. Municipal Engineering and Sanitary Record, Nov. 20, London, England.

Relative Sanitary Values of Different Types of Drinking Fountains. Results of tests of vertical-nozzle types. By L. V. Dieter, bacteriologist, Health Dept., D. C., 4 ills., 2,000 words. American City, November, New York.

Engineering and Construction Prospects in Roumania. Much work needed on railroads; several large bridges to be rebuilt; paved streets needed; harbor extensions desirable. By R. S. Doman, Amer. Red Cross. 1,600 words. Engineering News-Record, Nov. 27-Dec. 4, New York.

Increasing Municipal Revenue by Developing Harbor and Inland Waterway Facilities. By C. W. Stanford, consltg. harbor engr., Mann & MacNeille, N. Y. C. 2 ills., 1,100 words. American City, November, New York.

Tidal Storm at Corpus Christi and Its Effect on Engineering Structures. High water sweeps over barrier islands, relied upon for protection; buildings demolished; serious damage done to concrete causeway. By T. Bartlett, Bartlett & Ranney, engrs., San Antonio, Texas. 7 ills., 4,000 words. Engineering News-Record, Nov. 13-20, New York.

Development of Favorable Public Opinion Toward Utilities. Policy of decrying publicity and information has changed to one of taking public into confidence; employes and stockholders can help. Paper before Illinois State Electric Ass'n, by J. F. Gilchrist, vice-pres., Commonwealth Edison Co., Chicago. 1 ills., 3,700 words. Electrical Review, Nov. 1, Chicago.

Railway Bridge Painting Practice. 600 words. Engineering News-Record, Oct. 30-Nov. 6, New York.

OFFICIAL ADVERTISING

Pennsylvania State Highway Department, Harrisburg, Pa.—Sealed proposals will be received on or before January 19, 1920, for the furnishing, delivering and installing at Harrisburg, Pa., of dumping equipment with hydraulic and hand hoist, on Peerless, Heavy Aviation, Nash, Pierce and Packard chassis. Bidding blanks and specifications will be furnished free, as well as all necessary information, upon application to State Highway Department, Harrisburg, Pa. LEWIS S. SADLER, State Highway Commissioner.

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Sealed proposals for 1,500 feet fire hose will be received by the Commissioners of the Town of Phillipsburg, N. J., on or before Wednesday, January 21, 1920, at 2:00 P. M. The Commissioners reserve the right to reject any or all bids. Samples and prices to be submitted to

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Phillipsburg, N. J.

Pennsylvania State Highway Department, Harrisburg, Pa.—Sealed proposals will be received at the State Capitol until 10:00 A. M., January 27, 1920, when bids will be publicly opened and scheduled, and contracts awarded as soon thereafter as possible, for the reconstruction of the following pavements: 10,610 linear feet of Reinforced Concrete in Armstrong County; 3,055 feet of Vitrified Brick in Beaver County; 46,966 feet of Reinforced Concrete in Butler County; 24,207 feet of Reinforced Concrete in Cambria County; 23,420 feet of Reinforced Concrete in Carbon County; 13,027 feet of Reinforced Concrete and Hillside Vitrified Brick, also 7,291 feet of Reinforced Concrete in Clearfield County; 18,514 feet of Reinforced Concrete, also 18,619 feet of either One Course Reinforced Concrete and Hillside Vitrified Brick or Two Course Reinforced Concrete and Hillside Vitrified Brick in Crawford County; 41,753 feet of either Bituminous Surface Course on a Concrete Foundation or Reinforced Concrete in Dauphin and Perry Counties; 5,467 feet of Reinforced Concrete, also 14,496 feet of Reinforced Concrete and Hillside Vitrified Brick in Fayette County; 23,201 feet of Reinforced Concrete in Greene County; 14,800 feet of Reinforced Concrete in McKean County; 20,164 feet of Reinforced Concrete in Northampton County; 12,925 feet of either Bituminous Surface Course on a Concrete Foundation or Reinforced Concrete in Potter County; 39,500 feet of Reinforced Concrete and Hillside Vitrified Brick in Schuylkill County; 3,419 feet of Reinforced Concrete in Venango County; 22,287 feet of Reinforced Concrete and Hillside Vitrified Brick; also 54,577 feet of Reinforced Concrete in Warren County; 79,664 feet of Reinforced Concrete and Hillside Vitrified Brick in Westmoreland County. Bidding blanks and specifications may be obtained free, and plans upon payment of $2.50 per set, upon application to State Highway Department, Harrisburg, Pa. No refund for plans returned. They can also be seen at office of State Highway Department, Harrisburg; 1001 Chestnut Street, Philadelphia, and 904 Hartje Building, Pittsburgh, Pa. LEWIS S. SADLER, State Highway Commissioner.

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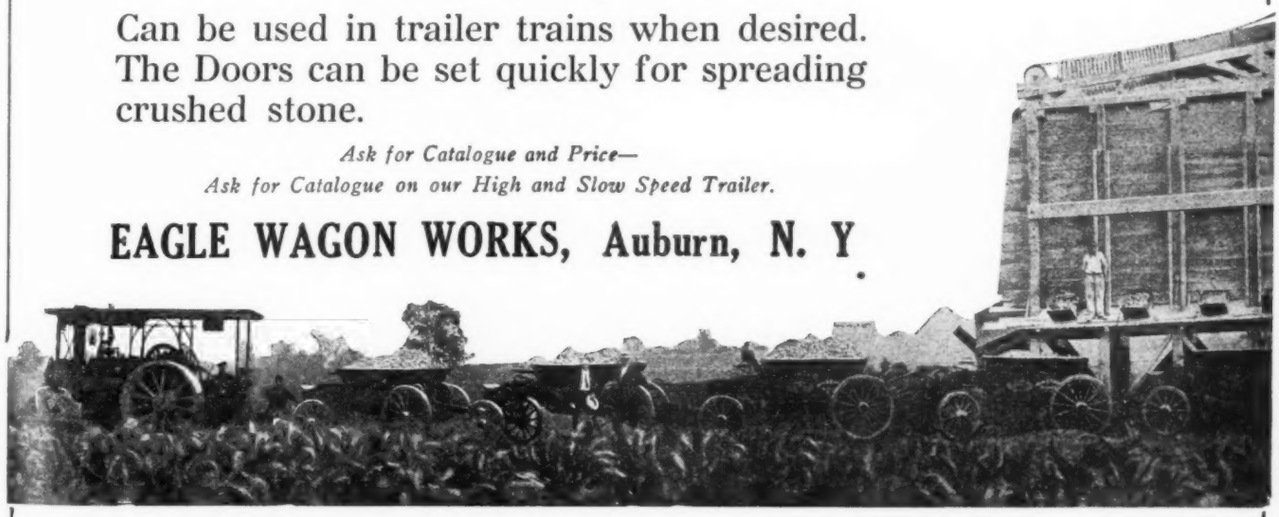

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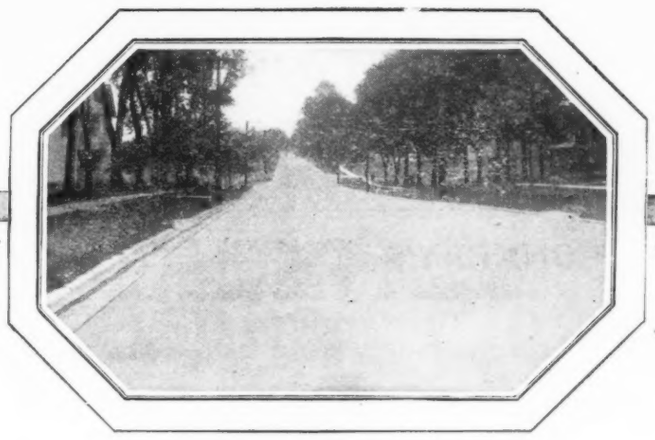

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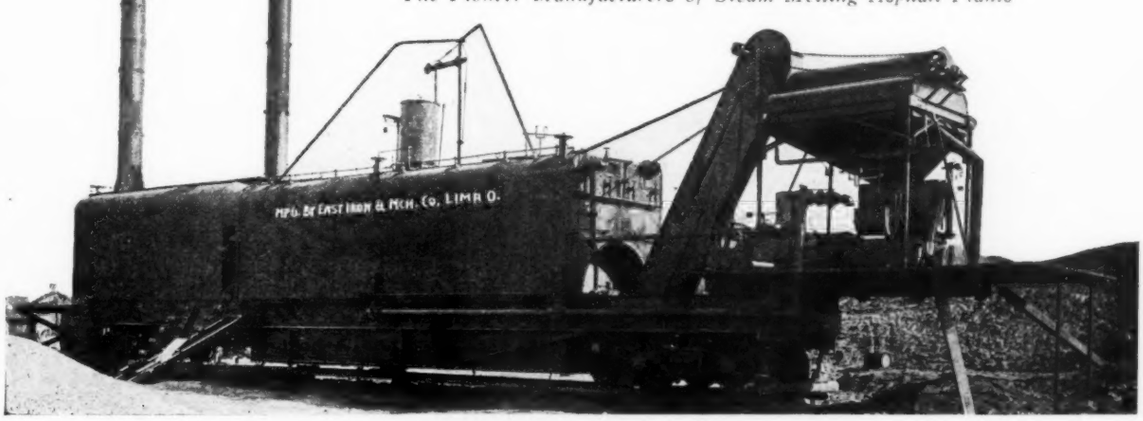

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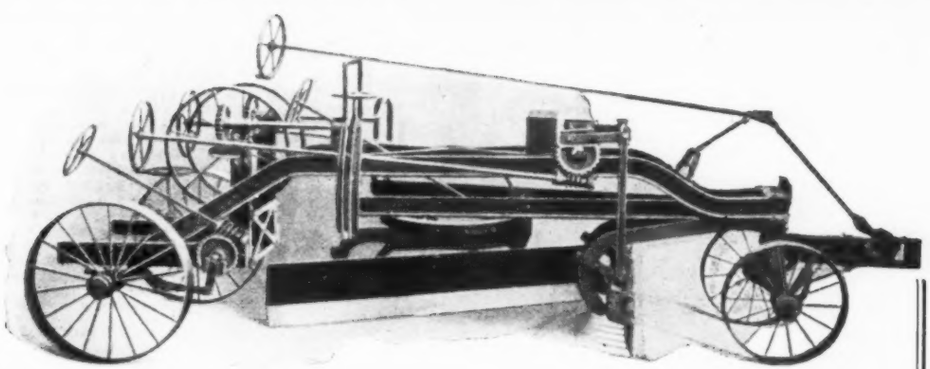

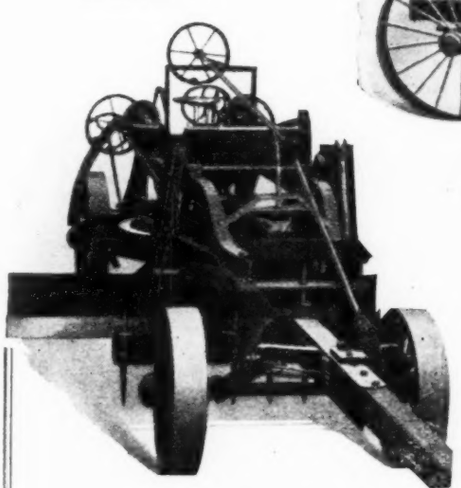

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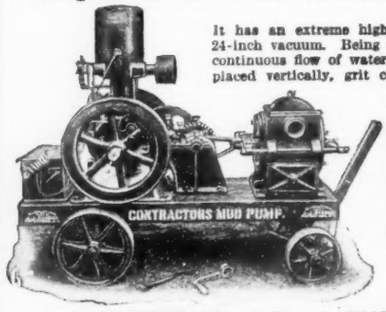

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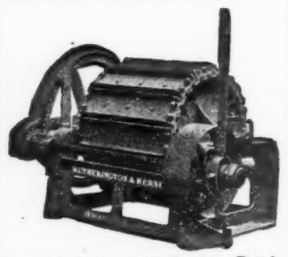

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As we now build this machine it embodies all of the

Latest Improvements

and refinements of construction that have been found desirable during a period of try-out covering almost one year of time and conducted under the direction of the technical committee of the National Paving Brick Manufacturers' Association.

For descriptive circular and prices address

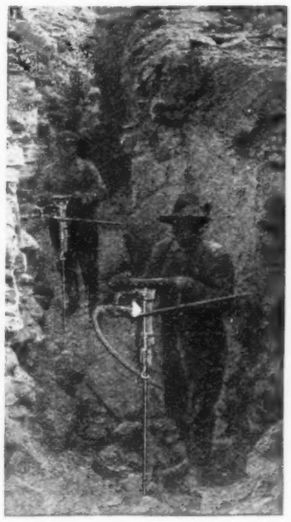
HETHERINGTON & BERNER
INDIANAPOLIS, INDIANA

Cheaper Rock Drilling In Trenches

At Winston-Salem, N. C., contractors reduced the cost of drilling rock in a sewer trench 80% by substituting

SULLIVAN ROTATORS

for hand drilling.



The trench was about three feet wide and the rock cut was 400 feet long, ranging from three to twelve feet in depth. Tube Rotators, holes three to four feet deep were put in, three to five feet apart. Sixty per cent dynamite was employed, the holes being filled about two-thirds full and the balance tamped with clay. The rock was hard and broken.

Bulletin 3370-F Describes "Rotators"

SULLIVAN MACHINERY CO.
122 So. Michigan Ave. CHICAGO

Equipment Bargains

When in **immediate** need of contractors' equipment for paving, road construction, waterworks, sewerage, or power plants, or municipal supplies, **look under "Equipment Bargains"** in the current issue.

If it is not advertised there, send us a small **Want Ad** and you will get in touch with someone who can supply your needs.

Rye, New York; Standard Asphalt Binder "B"; 1911

STANDARD

Refined Mexican Asphalt

(Socony Brand)

for Sheet Asphalt Paving

Contains approximately 99.5% of pure bitumen, which does not precipitate under any conditions. Our refining process insures an absolutely uniform product of proper consistency.

Standard Asphalt Macadam Binders A, B and C
Standard Asphalt Road Oils
Standard Paving Flux
Standard Fillers for Brick and Block Pavements
Standard Asphalt and Preserving Oil
Standard Cold Patch Asphalt

Specifications and all other particulars furnished upon request

SOCONY ASPHALTS AND ROAD OILS

STANDARD OIL CO. OF NEW YORK
Road Oil Dept. 26 Broadway, New York

COLD PATCH

Maintenance Our Specialty
HEADLEY GOOD ROADS CO.
Franklin Trust Building
Philadelphia, Pa.

ASPHALT AND ROAD OIL

Asphalt Sales Dept.
OFFICES

New York	Houston
Boston	Chicago
Philadelphia	Cleveland
Richmond	Toledo
Jacksonville	Kansas City
Tampa	Des Moines
New Orleans	Minneapolis
Memphis	Wichita

TEXACO ASPHALT ROAD OILS
THE TEXAS COMPANY
Asphalt Sales Department
17 BATTERY PLACE, NEW YORK CITY

TEXACO ASPHALT REG U.S. PAT. OFF.

AZTEC ASPHALT

THE
UNITED STATES ASPHALT REFINING COMPANY
90 West Street, New York

A few reasons

Why

The user likes

The Eagle Dumper

ITS light draft.

ITS low repair bills.

ITS arched rear axle.

ITS foolproof dumping device.

"Quality rather than price"

One and one-half yard Dump Wagon

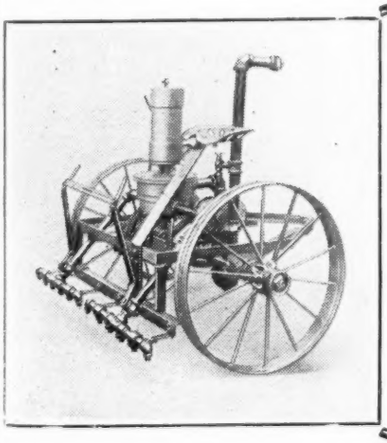
The Eagle Line

Dump, Ash, Garbage, Spreading — Wagons

High Speed, Low Speed — Trailers

Semi-Ford Truck Bodies

THE EAGLE WAGON WORKS AUBURN NEW YORK



FOR ROAD OILING

USE A RELIANCE OIL SPRAYING TRAILER

It is not necessary to own an expensive oiling wagon—our trailer will do the work exactly as well with ONE-HALF the investment.

Will save its cost in one season

Let us quote you prices

UNIVERSAL ROAD MCHY. CO.

KINGSTON, N. Y.

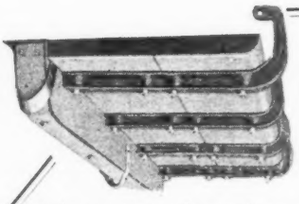
RELIANCE LABOR SAVING ROAD BUILDING EQUIPMENT

WYCKOFF PIPE & CREOSOTING CO.
30 East 42d St., NEW YORK
Send for Catalogue "D"

WYCKOFF
CREOSOTED WOOD BLOCKS
WILL NOT BUCKLE OR DECAY

WYCKOFF
CONDUIT for underground wires, and all forms of creosoted wood; also Wooden Water Pipe and Steam Pipe Casings. Creosoting Works and Factory: Portsmouth, Va.

SERVICE FIRST
IRONSTONE BLOCK
REPRESSED OR DUNN WIRE-CUT-LUG
Terre Haute Vitrified Brick Co., Terre Haute, Indiana



WATSON Bottoms

being made of wood cannot be battered like steel. Loading stone from a steam shovel will in time break the bottom of an ordinary wagon. This means buying a whole new outfit. With the WATSON bed piece and rigid framework it means only the replacing of the planks which can be done quickly, easily and inexpensively.

Let us tell you more about these wagons.

Watson Products Corp., Canastota, N. Y.

APPROVAL

HERSEY DETECTOR METER

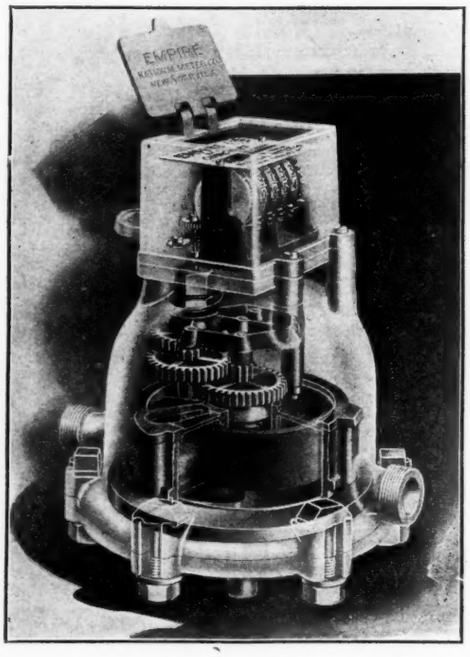
The Hersey Detector Meter has been accepted for thirteen years in 3", 4", 6", 8", 10" and 12" sizes without any restrictions or conditions of any kind by every Insurance Company, Stock and Mutual, doing business in the United States, and by the Water Departments and Water Companies in more than 600 Cities and Towns for use on over 4,000 Fire Services protecting over $2,000,000,000. worth of Insured Property.

HERSEY MANUFACTURING COMPANY

BOSTON NEW YORK CHICAGO COLUMBUS, O

PHILADELPHIA ATLANTA SAN FRANCISCO

EMPIRE



The EMPIRE is the supreme point of water meter construction. No better water measuring device is made. For sensitiveness, accuracy and durability it has never been surpassed.

UNEQUALED RECORD

You will want to investigate for yourselves, rather than accept our "say-so," but we append a few figures for your convenience.

SENSITIVE—Casual tests of a ⅝ on .008 inch opening at 40 pounds pressure, discharge one gallon per hour.

ACCURATE—⅝ size, after 10 years active service tested only ½ of 1% slow on 1/16 inch stream.

DURABLE—30 years' service with repair costs of less than ½ of 1% per annum.

RELIABLE—Out of 1800 in use in one city only four found "stopped" between readings.

Names of these cities on request.

Send for Further Particulars and Prices to

NATIONAL

299 BROADWAY, NEW YORK **ESTABLISHED**

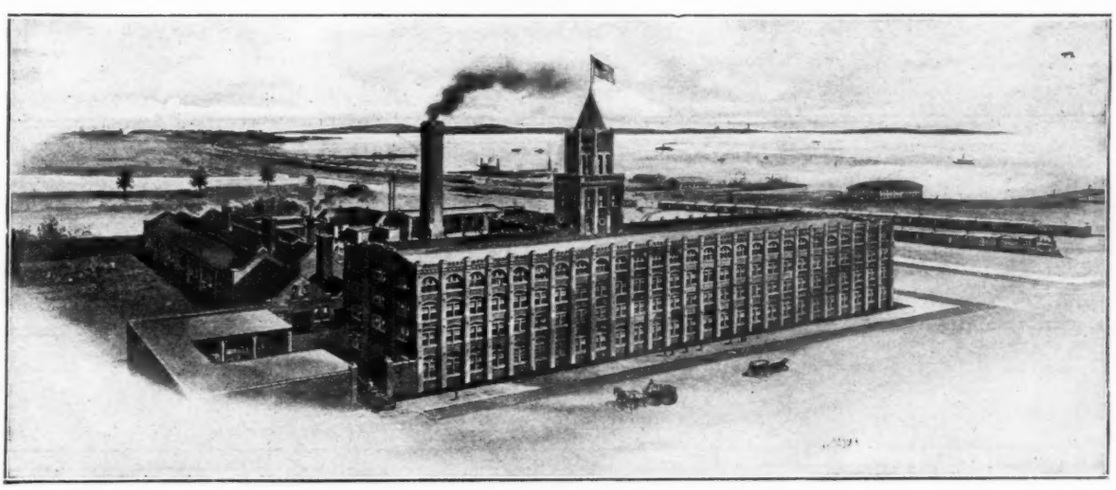
Branches in all other Principal

WATER METERS

We manufacture water meters of every style but only one quality—the best. Our six types: the CROWN, NASH, GEM, EMPIRE, EMPIRE-COMPOUND, and PREMIER completely fill every requirement, and are recognized standards in their different lines.

FIFTY YEARS OF SERVICE

have made us fairly familiar with the needs and problems of waterworks engineers, and we are pleased at all times to give them the benefit of our long experience whenever they care to avail themselves of it.



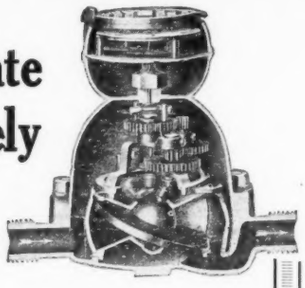
THE PLANT BEHIND THE PRODUCT

METER CO.

1870 299 BROADWAY, NEW YORK

Cities of the United States, also Winnipeg and London

King Disk Meters Are Accurate Because They Are Built Accurately



A water meter must do more than merely indicate on a dial an amount of water—it must measure and record **accurately.** A water meter must do this for more than a few months—its accuracy must be **lasting.**

This principle of **lasting accuracy** is the idea of service behind every KING DISK METER.

The design is simple—from the water passages to the register dial. All internal parts are assembled in a working unit, readily accessible for inspection without removing the meter from the service pipe.

Materials are the best that can be obtained for their specific purposes. Monel metal for the spindles and screws, hard rubber gears and Monel pinions mean minimum friction and long wear—and lasting accuracy.

The same UNION quality goes into every one of the whole range of UNION products—"Nilo" meters, corporations, curbs and waste stops, cement-lined pipe presses. We have made waterworks specialties since 1868—we have improved designs with our increasing experience—but we could not improve **quality. That has always been the best.**

UNION WATER METER CO., Worcester, Mass.

CLARK ABSOLUTE GUARANTEE

A Warrant of Satisfaction in 30 Years' Service. A METER NEVER HAS FROZEN WHERE PROPERLY INSTALLED IN A CLARK METER BOX. The ONLY system that houses ALL sizes and makes of meters in the same UNIFORM manner wherever set. The ORIGINAL individual features of the CLARK LINE are invaluable.

SEND FOR CATALOGUE

H. W. Clark Co., 1508 Broadway, Mattoon, Ill., U. S. A.

Trade Mark NEW YORK SALT LAKE CITY SAN FRANCISCO CHICAGO

S. E. T. Specialties

"CALHOUN" METER BOX

Maximum of Security—Extreme of Simplicity

Self-Locking Cover—Frost Protection Air Chamber—No Bolts or Hinges—Plenty of room at top to take out meter—Made in 4 sizes for 15", 18", 20" and 24" base—Outer lid in two styles overhanging or flush with rim.

Calhoun Meter Box

Calhoun Meter Box

S. E. T. Valve and Hydrant Co.

Specialties in Cast Iron Housings and Manhole Tops

HUDSON TERMINAL BUILDING NEW YORK CITY

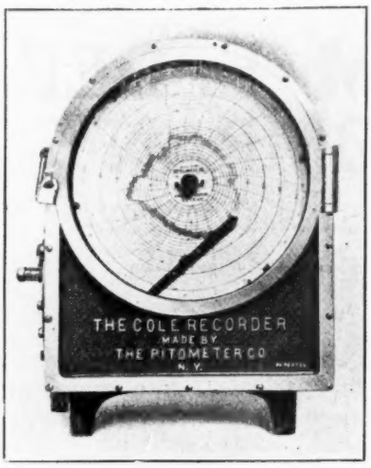
COMMERCIAL TRUST BUILDING, PHILADELPHIA, PA.

Present Day Conditions demand higher Efficiency in water works operation

The increased cost of production including the higher costs of fuel, labor and material are making conservation measures more and more necessary. The record of the actual daily and hourly supply of water must be obtained if you are to operate your plant to the top notch of efficiency and economy.

The Cole Recording Pitometer is portable. Install it in your pumping station and use it also for checking up manufacturing consumers, testing large meters, analyzing the supply, determining by trunk main tests which of your main feeders are overtaxed and which are not doing their share, locating underground losses, etc.

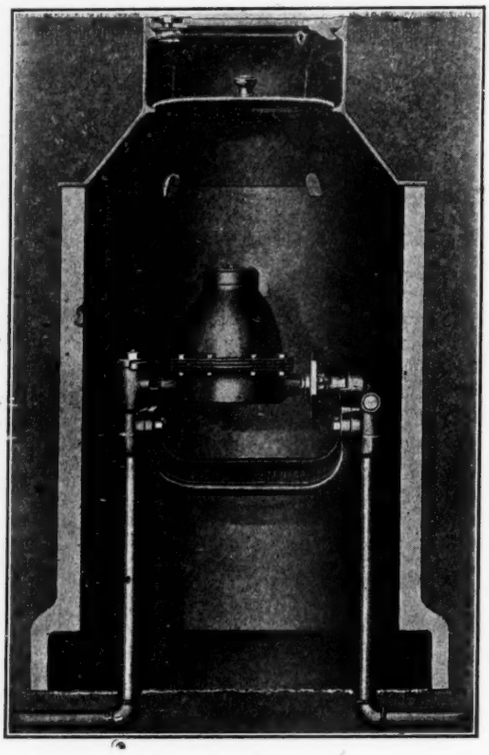
The Cole Recorder



Our illustrated booklet on the Cole Pitometer System will be sent free for the asking. Every municipal official ought to be acquainted with the greater possibilities for efficiency and economy in water works operation which are mentioned in this catalog.

The Pitometer Company

27 Elm St., New York



A Meter Well Bought is Not Half Set

We believe that the curb is the only logical place for a water meter, for the following reasons:

A.—Meter is safe from frost damage.

B.—Meter is safe from tampering.

C.—Consumer is always at home to reader and in consequence inspector will read many more meters per day than with basement settings.

D.—The reader is relieved of any temptation to record fictitious readings because of consumer's absence from home.

E.—The liability of admitting a burglar under guise of a meter reader is avoided.

F.—All water entering property is registered and leaks on inside piping will be promptly repaired.

G.—Meter is less liable to damage from hot water backing up from range boiler when located at curb.

H.—Ordinary curb box and curb stop may be done away with if desired.

There are a lot of other reasons and meter boxes are cheap. Write us.

FORD METER BOX COMPANY, Wabash, Indiana

MICHIGAN

PRODUCTS

FIRE HYDRANTS
GATE VALVES
SLUICE GATES
CHECK VALVES
FOOT VALVES
SHEAR VALVES
TIDE VALVES
SLEEVE VALVES
INDICATOR POSTS
VALVE BOXES

FLOWER VALVE MANUFACTURING CO.

105 PARKINSON STREET,
DETROIT, MICH.

D & D

Pat. No. 965,163

Safety and Noiseless Cover

WM. E. DEE COMPANY

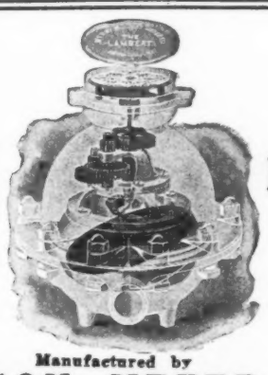
30 N. LA SALLE STREET
CHICAGO, ILL.

WE MANUFACTURE

Manhole, Catch Basin and Sewerage Castings of all kinds. We make anything in Gray Iron. Write for our prices.

NEW YORK CHICAGO
Keystone Arctic
Keystone Compound
Eureka Utility
COLUMBIA, S.C. KANSAS CITY
Water Meters
Pittsburgh Meter Co.
East Pittsburgh, Pa.
LOS ANGELES SEATTLE

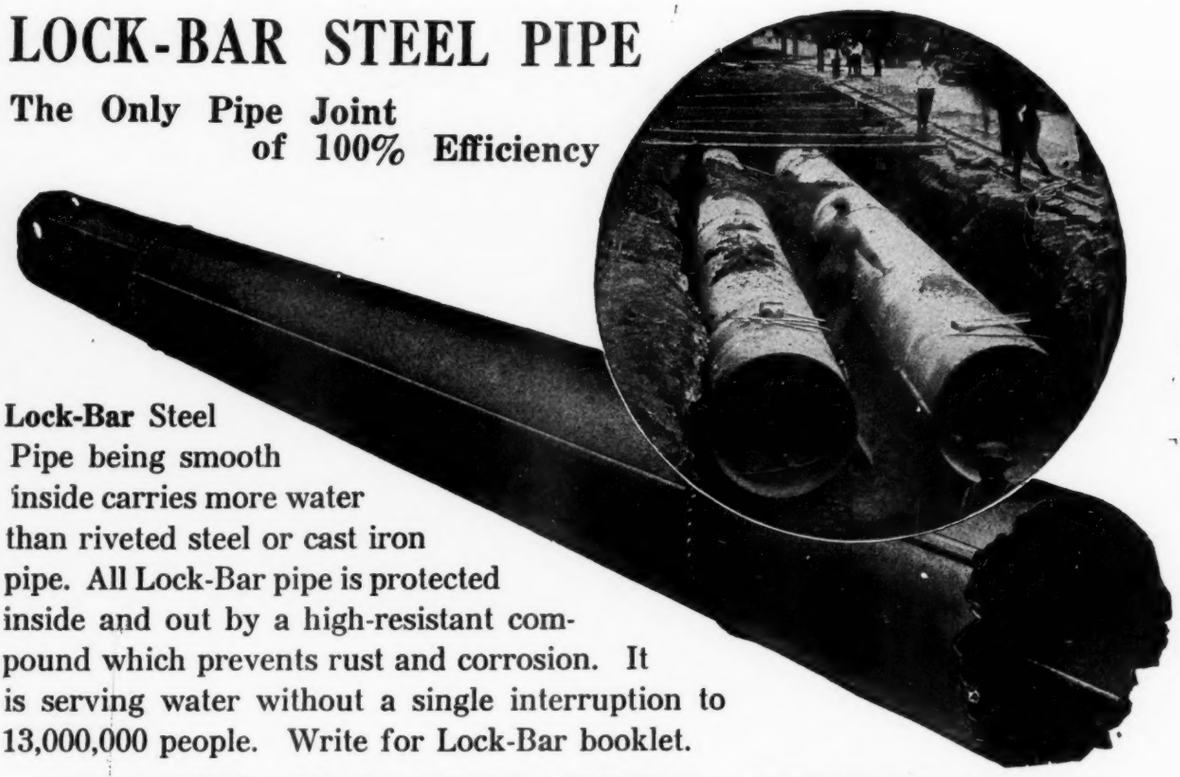
Lambert Meters



Manufactured by
THOMSON METER CO.
100-110 BRIDGE ST., BROOKLYN, N. Y.

LOCK-BAR STEEL PIPE

The Only Pipe Joint of 100% Efficiency

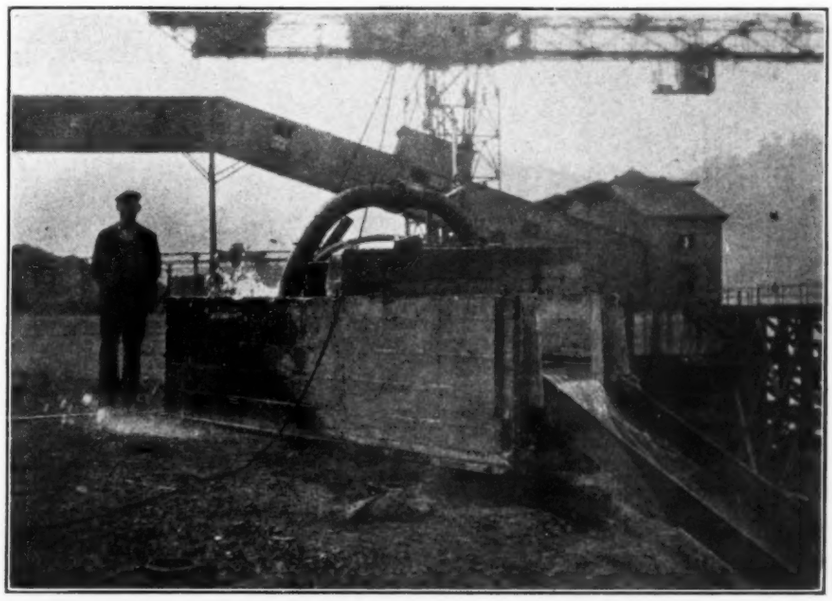


Lock-Bar Steel Pipe being smooth inside carries more water than riveted steel or cast iron pipe. All Lock-Bar pipe is protected inside and out by a high-resistant compound which prevents rust and corrosion. It is serving water without a single interruption to 13,000,000 people. Write for Lock-Bar booklet.

EAST JERSEY PIPE COMPANY

Fulton and Church Streets, New York City **Works: Paterson, N. J.**

15% MORE WATER
19% LESS POWER



400 G.P.M. LaBelle Iron Works

The nine wells at the LaBelle Iron Works were equipped with nine Air Lift Pumps, giving 1,800 G.P.M. with 171 R.P.M. of their large Air Compressor.

Last summer an Indiana ECONOMY Air Lift Pump was installed in each well, and a smaller pulley was put on the motor driving the Compressor. The acceptance test showed that the wells were then giving 2,100 G.P.M. with 138 R.P.M. of the Compressor, and with the pressure no higher. In other words, the ECONOMY Pumps were delivering 15% More Water with 19% Less Power.

This achievement is not unusual; it has been and is being duplicated by our ECONOMY Pumps in installations against every other type of Air Lift Pump.

If you would like to know what can be done at your plant, let us know your well conditions and water requirements.

INDIANA AIR PUMP COMPANY

INDIANAPOLIS, INDIANA

A 12″ Rife Hydraulic Ram installed for New York City Water Works.

The Largest Ram in the World

that is used successfully is operating under a fall of four feet and a pumping head of twenty-one feet.

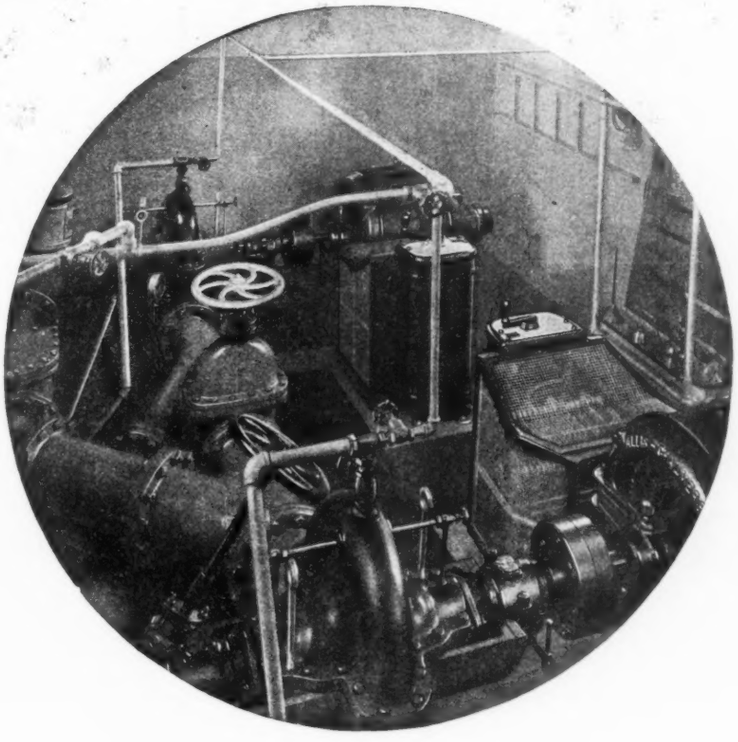
Write for catalogue.

RIFE ENGINE COMPANY

90 West Street New York, N. Y.

ALLIS-CHALMERS CENTRIFUGAL PUMPS

Are Reducing Pumping Costs in Many Cities

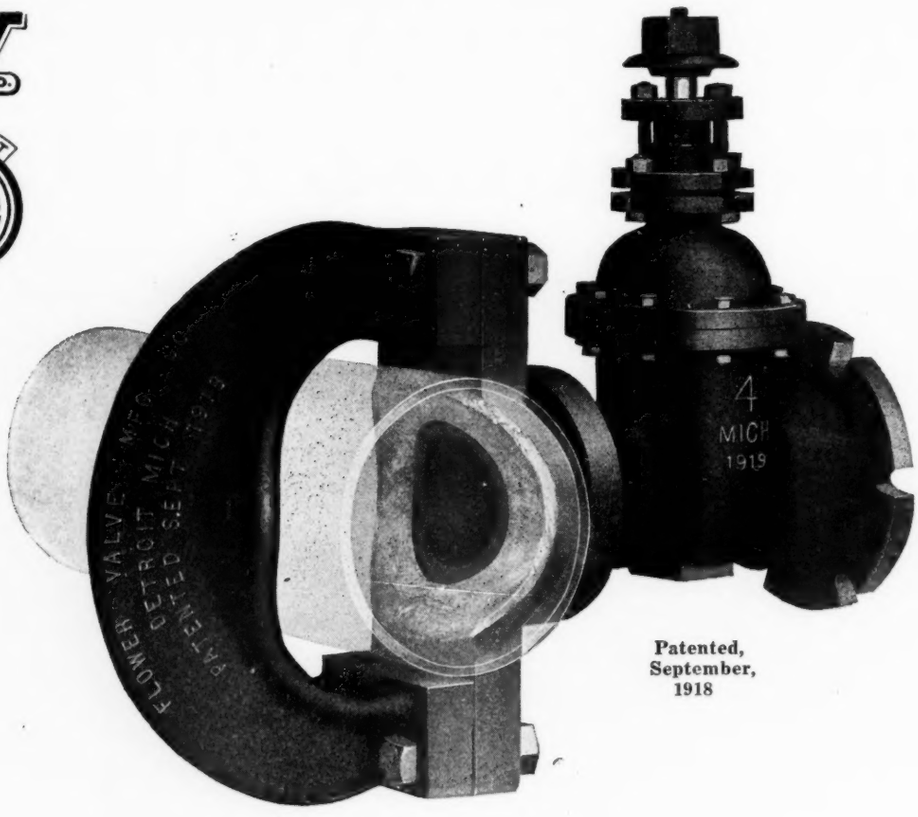


The accompanying photo shows two Allis-Chalmers 8″ Type "S" Centrifugal Pumps with motors furnished for the City of Saginaw, Michigan. Two duplicate units have just been shipped for another station in this same city, indicating the satisfaction given by properly selected combined units. Our engineers will assist you in solving your pumping problems.

Write for Bulletin 1632B

ALLIS-CHALMERS

MILWAUKEE



Patented, September, 1918

Get the Facts On This Sleeve

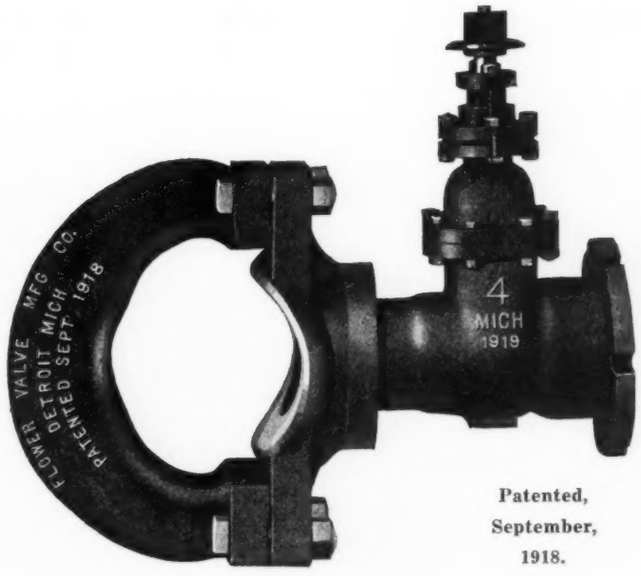
The new Flower sleeve has saved time, money and labor in making taps the country over. Engineers everywhere have quickly recognized its value.

If you haven't had details of this improved sleeve with the "built-in" lead, send for it at once. We want to have a copy of the sleeve data sheet in every engineer's files.

FLOWER VALVE MANUFACTURING COMPANY

105 PARKINSON STREET **DETROIT, MICHIGAN**

(24)



Patented,
September,
1918.

BETTER MATERIALS AND BETTER METHODS

Rising labor costs and the difficulty of securing labor at any cost, are forcing a situation that presents a serious problem to municipalities. The solution must come by employing materials and methods that save labor.

Engineers quickly recognized the value of the improved Flower sleeve in cutting labor cost. A shallower trench, no pouring of lead on the job, little or no caulking—all these features speed up work. And the saving of lead is considerable.

We will gladly send data sheet on this sleeve.

FLOWER VALVE MANUFACTURING COMPANY

105 Parkinson Street **Detroit, Michigan**

(25)

"Turnkey Jobs"

Our Service is Complete, as our organization includes Engineers, Field Construction Forces and Factory Facilities which puts the burden of getting results on us—Hence the Guarantee

"Water, or No Pay"

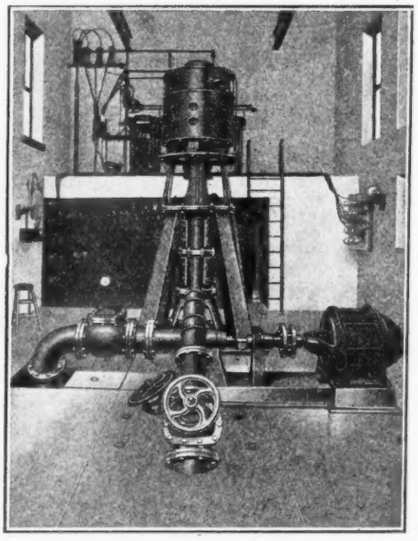
We Write It in the Contract

Write today for Information and Free Literature.

Layne & Bowler Company

"World's Largest Water Developers."

759 Randolph Building
Memphis, Tenn.



SERVICE AND FIRE PROTECTION

Layne Deep Well Turbine Pump ordinarily operating against service pressure by-passing horizontal Turbine. Horizontal Turbine is cut in for fire pressure.

Cast Iron Pipe in the City of Albany

From an old "Minute Book" of the Bureau of Water of the City of Albany, N. Y.—By courtesy of Wallace Greenalch, Water Commissioner.

At a meeting of the Trustees of the Albany Water Works, at the office of the Treasurer on the 18th March 1813.

Present—The President—Mr. Hale, Mr. Hutton & Mr. Brinckerhoff.

A Communication from Stephen Van Rensselaer Esquire was read and ordered to be filed.

Resolved that the Clerk cause the following advertisement to be inserted in the several newspapers printed in this City, for one month—viz.

"Cast iron Conduits for the Albany water Works wanted.

"Notice is hereby given, that proposals in writing will "be received by the Subscriber, in behalf of the Trustees of "the Albany Water Works, for furnishing, by Contract "one hundred tons of Cast iron Conduits of a bore of six "inches diameter three feet in length, and five eighths "of an inch thick—The proposals are to be accom- "panied by two pipes, Connecting together, Spigot and "Faucet fashion, with an entrance of two inches, as "Samples of the Casting, and must be forwarded to the "Subscriber, by the first day of May next, and are to spec- "ify the shortest time at which the above, or any less "quantity of such Conduits, Can be delivered at the City "of Albany By order of the trustees of the Albany Water Works, Albany March 1813. J. V. V. Olph"

At a meeting of the Trustees of the Albany water works, at the office of the Treasurer on Saturday the 1st May 1813.—

Present. The President—Mr. Hale, Mr. Hutton & Mr. Brinckerhoff.

The Treasurer laid before the board sealed proposals from applicants for furnishing Cast iron Conduits, agreeably to the advertisement published by the board, which when opened, were found to be as follows, viz.t

1. From Thomas Trenor of Bennington, offering to furnish them at the rate of $28 p ton of three feet in length.
2. From Elisphalet Sturtevant of New York, offering at $140 per ton of three feet in length, or $120 of two feet long.
3. From Holley & Coffing of Salisbury in Connecticut, offering them at $100 per ton in joints of the length of two feet each.

The Board having taken each of the said proposals into due Consideration—Thereupon

Resolved that the proposals from Holley & Coffing of Salisbury be accepted of; and that the Treasurer be directed in behalf of this Board to notify them accordingly; and that the Board are ready to enter into a Contract; & also that the Treasurer direct said Contractors to prepare and send on to this City without delay, two hundred joints of two feet long Carefully Cast, as a fair Sample of the work, agreeably to a description to be laid down on paper by the Superintendent and tendered to them, in order that

There is now 164 miles of cast-iron pipe in the water system of the City of Albany, and much of the pipe bought in 1813, though not now in service, is still in the ground in perfect condition.

THE FIRST CAST IRON PIPE EVER MADE IN THE WORLD'S HISTORY IS STILL IN SERVICE
SERVICE
CAST IRON PIPE
MEASURED BY
CAST IRON PIPE
CENTURIES
MORE THAN 250 YEARS OLD

The Cast Iron Pipe Publicity Bureau

1 Broadway New York

GRAVITY and PRESSURE

FILTERS

Send for Bulletin No. 15

Hypochlorite Apparatus and Water Softening Plants

THE NEW YORK CONTINENTAL JEWELL FILTRATION COMPANY

General Offices and Works: NUTLEY, N. J.
111 W. Monroe St., CHICAGO New Birks Bldg., MONTREAL

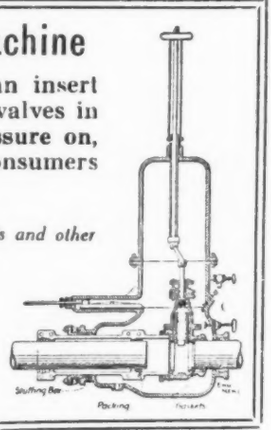
Valve Inserting Machine

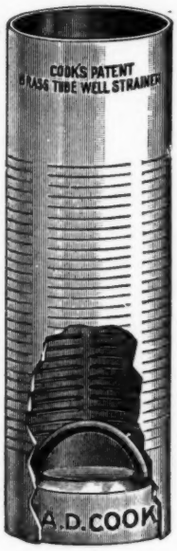
With this machine you can insert new and cut out defective valves in water mains with full pressure on, avoiding annoyance to consumers and increased fire risks.

Write for complete description of this and other water works specialties.

See Sweet's Catalogue, Engineering Edition, for Details and Particulars.

THE A. P. SMITH MFG. CO.
EAST ORANGE, N. J.





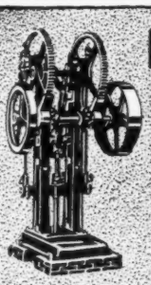
If You Have a DEEP WELL ending in WATER-BEARING SAND OR GRAVEL

equip it with the **COOK PATENT BRASS TUBE WELL STRAINER** and secure the maximum capacity of the well free from sand or particles of any kind. These strainers are in use by the Department of Water Supply of New York City, Parkersburg, W. Va., Memphis, Tenn., and Dayton, Ohio.

Upon the completion of the well, allow me to quote upon a **Steam, Belt or Motor Driven Deep Well Pumping Outfit.**

WRITE FOR NEW CATALOGUE

A.D.COOK, Manufacturer, Lawrenceburg, Ind., U.S.



DOWNIE DEEP WELL PUMPS

Double and single stroke models; direct steam driven or geared to motors. They are offered for heavy, continuous service in deep wells. Catalog No. 6.

CENTRIFUGALS

Keystone Driller Co., Beaver Falls, Pa.
Mfgrs. Keystone Excavator and Well Drills
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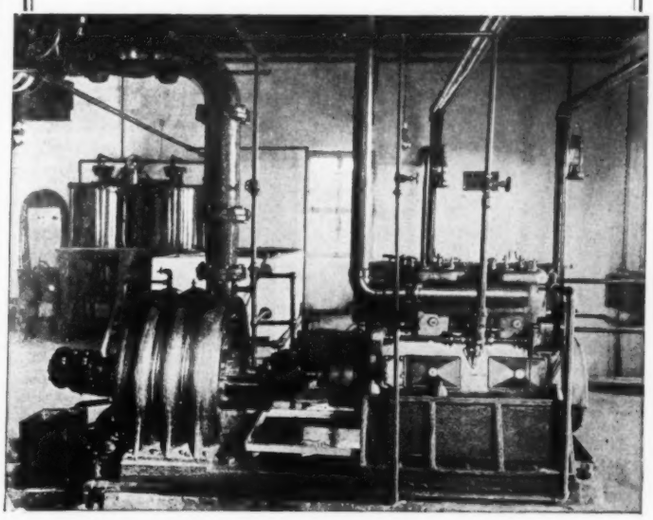

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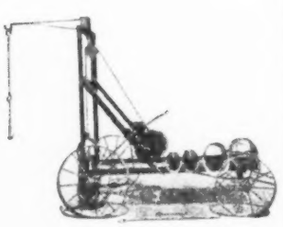

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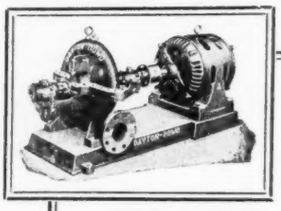

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*Sterling Engine Co., 1252 Niagara St., Buffalo, N. Y.

SCREENS FOR WELLS.
*Cook, A. D., Lawrenceburg, Ind.
*Layne & Bowler Co., 1117 Exchange Bldg., Memphis, Tenn.

SHEAR VALVES.
*Coldwell-Wilcox Co., Newburgh, N. Y.

SLEEVES AND VALVES.
*Kennedy Valve Mfg. Co., Elmira, N. Y.
*Smith, A. P., Mfg. Co., East Orange, N. J.

SLUICE GATES.
*Coldwell-Wilcox Co., Newburgh, N. Y.

STRAINERS.
*Cook, A. D., Lawrenceburg, Ind.

TANKS.
*Walter A. Zelnicker Supply Co. in St. Louis, U. S. A.

TAPPING MACHINES.
*Smith, A. P., Mfg. Co., East Orange, N. J.

VALVES.
*Flower Valve Mfg. Co., 105 Parkinson St., Detroit, Mich.
*Kennedy Valve Mfg. Co., Elmira, N. Y.
*Rensselaer Valve Co., Troy, N. Y.

VALVE BOXES.
*Modern Iron Works, Dept. M. J., Quincy, Ill.
*S. E. T. Valve & Hydrant Co., 50 Church St., N. Y. City.

WASTE DETECTION.
*The Pitometer Co., 27 Elm St., N. Y.

WATER MAIN CLEANING.
*National Water Main Cleaning Co., 274 Hudson Terminal Bldg., New York.

WATER PURIFICATION.
*Electro Bleaching Gas Co., 19 East 41st St., N. Y.
*N. Y. Continental Jewell Filtration Co., Nutley, N. Y.

WATER STERILIZATION.
*Electro Bleaching Gas Co., 19 East 41st St., N. Y.

WATER SUPPLY FROM WELL SYSTEMS.
*Cook, A. D., Lawrenceburg, Ind.

WELL DRILLS.
*Layne & Bowler Co., 1117 Exchange Bldg., Memphis, Tenn.

ECONOMY IN WELL PUMPING

THE SULLIVAN AIR LIFT, figured on the basis of ultimate cost per gallon, is the cheapest system of well pumping you can install.

The cut shows the discharge reservoir of the Citizens' Ice and Fuel Co., at St. Paul; a Sullivan Air Compressor and Air Lift furnish the supply.

The absence of wearing parts in the well, the sustained efficiency of the system, the low expense for upkeep and attendance and the central power control, guarantee more and cheaper water as long as the wells are used, than any other method provides.

SULLIVAN MACHINERY COMPANY

(Pneumatic Pumping Dept.)

122 SO. MICHIGAN AVE., CHICAGO

B-E-E-SYSTEM OF
WASTE DISPOSAL
MUNICIPALITIES—HOSPITALS—INSTITUTIONS
CHICAGO INCINERATOR CO.
MONADNOCK BLOCK, CHICAGO, ILL.

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Shear, Flap and Butterfly Valves
FLEXIBLE JOINTS
COLDWELL-WILCOX CO
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Norwood Engineering Company
FLORENCE, MASS.
Mechanical Filtration for
Municipal and Industrial Purposes
Swimming Pool Filters

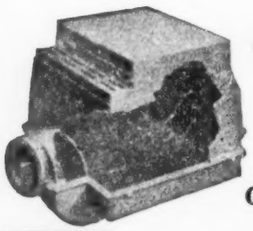
Buy "RENSSELAER" Valves
— and —
"COREY" Fire Hydrants
Rensselaer Valve Company, Troy, N.Y.
Branches: New York, Louisville, Pittsburgh, Chicago, New England

DIRECT OXIDATION PROCESS

APPARATUS FOR CARRYING OUT THIS PROCESS FOR SEWAGE AND WATER TREATMENT SUPPLIED UPON ENGINEERS' SPECIFICATIONS.

DIRECT OXIDATION PROCESS CORPORATION

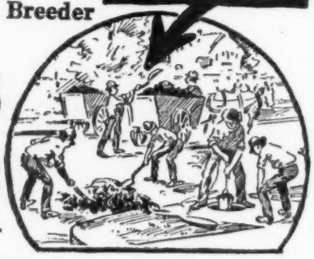
15th AND LEHIGH AVE. PHILADELPHIA, PA.



THIS

The Sanitary Way
or
the Old
Germ Breeder

OR THIS



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SEWER BASINS
mean better public health and a saving in labor and time in cleaning.
ODORLESS SEWER BASIN CO.
YOUNGSTOWN, OHIO

Manufacturers of
CAST RON PIPE

FOR WATER—GAS—CULVERTS—SEWERS
Also Flexible Joint Pipe—Cylinders—Tubes, Milled and Plain Ends
—High Pressure Fire Service Pipe—Special Castings.
Flanged Castings a Specialty.
Quality and Service Guaranteed

Warren Foundry & Machine Company
Offices, 11 Broadway, N. Y. 201 Devonshire St., Boston, Mass.
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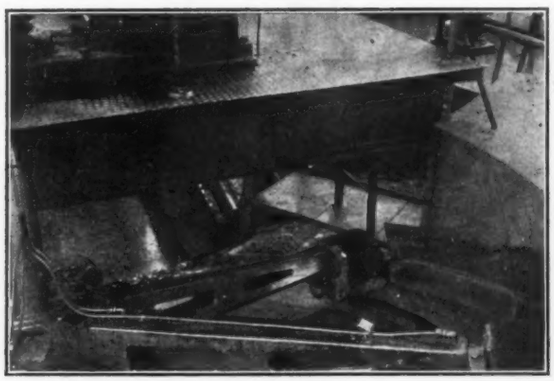
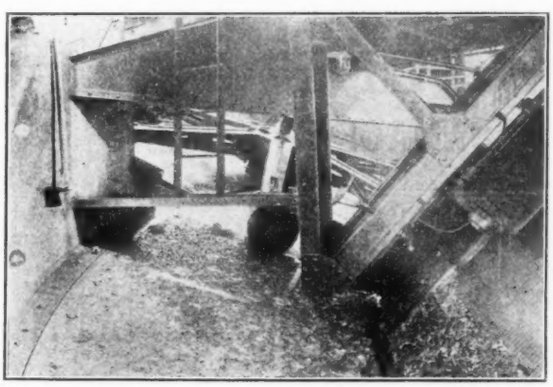
From Any Point of View the Sanitation R-W Process is the Most Efficient and Reliable Treatment for the Clarification of Sewage

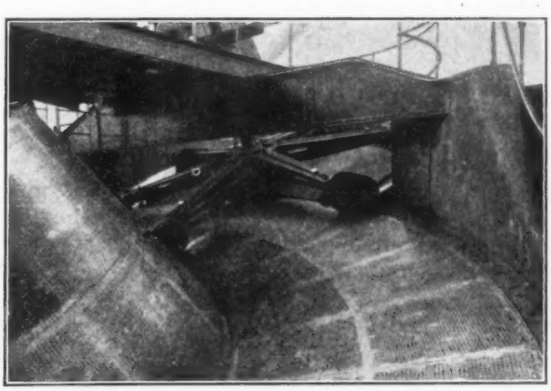
View of a section of a Riensch-Wurl Screen in service, showing the screen cone brushes and accumulation of screenings. The surface of sewage reflects the structural steel work. The clean portion of the screen cone is available for increased storm water flow.



View of a section of a Riensch-Wurl Screen in service, showing the action of the disc brushes in rolling screenings off the screen plate into the screening trough, where they are discharged into an elevator.



View of a section of a Riensch-Wurl Screen in service, showing screenings coming under the action of the brushes, also showing the design and construction of the Screen Seal.

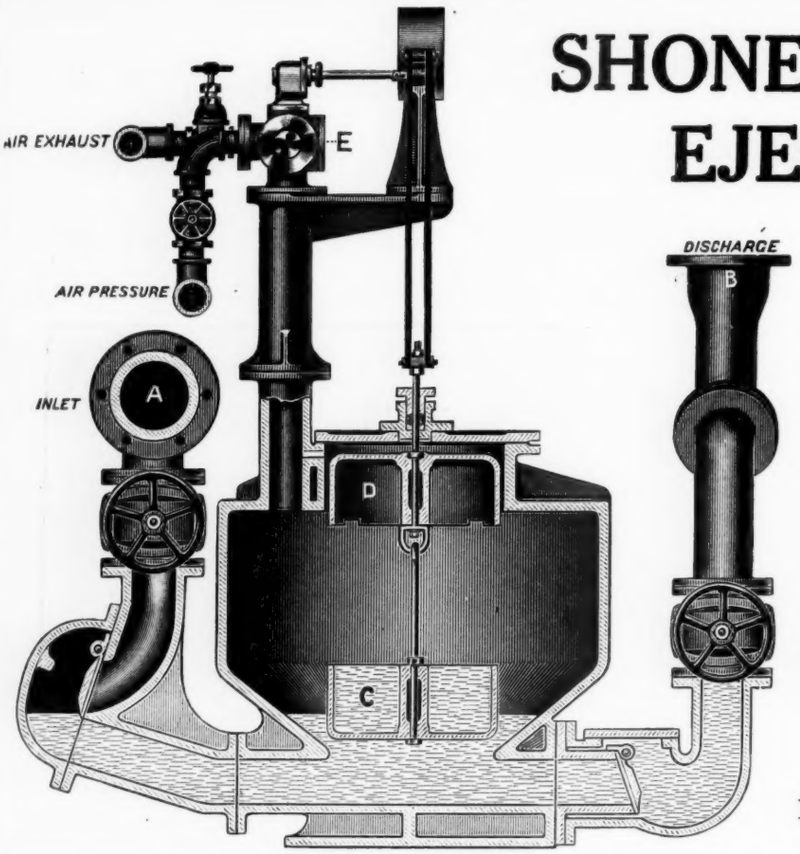


View of a section of a Riensch-Wurl Screen in service, showing the screen cone and disc plates coming away from the brush sphere. All parts of the disc plate have been brushed repeatedly by the disc brushes, the screen being absolutely clean as is evidenced by the visible details of screen plates.

THE SANITATION CORPORATION

Apparatus, Equipment and Complete Plants for Sewage Disposal

NEW YORK CITY



SHONE SEWAGE EJECTORS

A performance record of forty years in all parts of the world. Over 1000 installations. Non-clogging, sanitary, automatic, indestructible, no screens, no sedimentation. Shone Ejectors installed by the City of Chicago in 1891 still giving perfect service. Send for Bulletin.

Yeomans Brothers Company

1433 Dayton Street, Chicago

THIS MACHINE

LAYS SERVICE PIPES WITHOUT DAMAGE TO STREETS

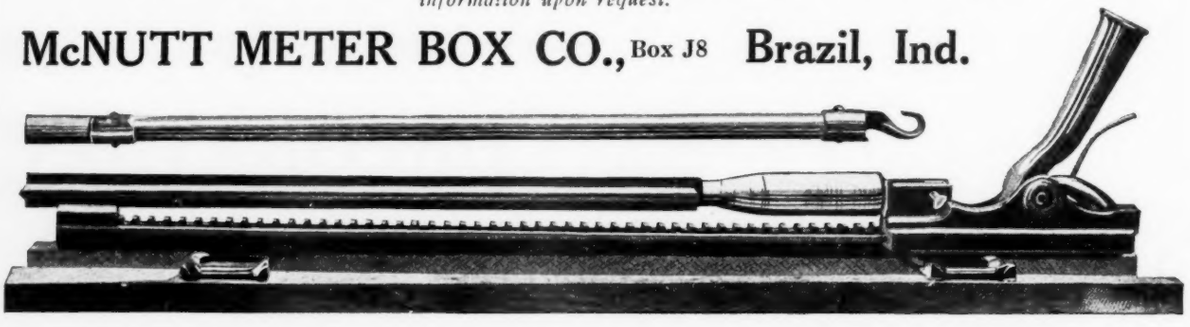
Your city—every city—takes pride in the appearance of its streets. Millions of dollars are spent annually in their upkeep. Then why tear them up uselessly, in order to lay service pipes? Our new method enables you to install services under streets, tracks and even buildings, without any property damage.

THE McNUTT HIGH-SPEED PIPE-PLACING MACHINE

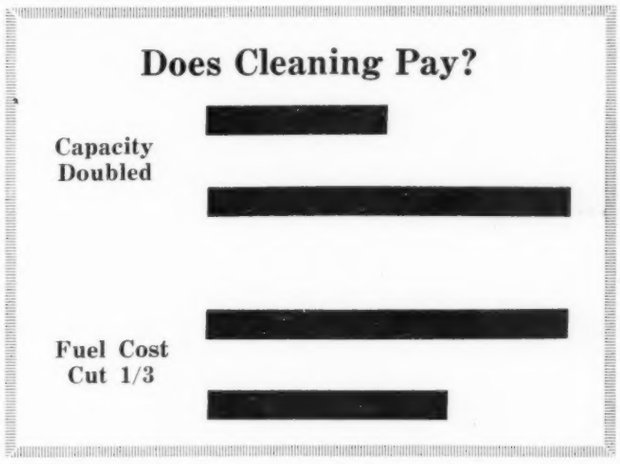
pulls services to place in full-length joints, either iron or lead pipe, in sizes from 4-inch diameter down to the smallest possible size. Two small excavations, one to hold the machine, the other across the street for the pipe entrance, is all you need. The McNUTT PIPE PLACING MACHINE is well made, powerful and easy to operate. Its sturdy simplicity fits it for hard, long-continued service. With this machine one man does the work of two in only a fraction of the time required under old methods. You save in cost of labor, in expense of street repairs, and protect your streets from damage.

Write for literature describing this time-, labor- and money-saving machine. Complete information upon request.

McNUTT METER BOX CO., Box J8 Brazil, Ind.



This Chart May Help Solve Your Water Problems



This Is What Happened in St. Augustine, Fla.

St. Augustine, Fla., found the fuel consumption of its pumping station increasing while capacity was decreasing. And with coal costs soaring, the money burden was becoming intolerable.

The cause was **dirty mains,** incrusted, lined with deposits—the pumps were working practically against a stone wall. The mains were cleaned by the **National Water Main Cleaning Co.,** and **fuel costs were cut 27.6 per cent.**

And not only that—the **carrying capacity** of the mains was **increased 97.6 per cent**—doubling distribution without a cent for new mains. The gained capacity had been taken up by the dirt shown in the picture—a pile taken from 6,111½ feet of 10-inch main.

Fuel saving, better water pressure, better service, cleaner water, safer fire protection—didn't St. Augustine get these cheaply?

Why not your city?

National Water Main Cleaning Co. 374 Hudson Ter. Bldg. New York City

NATIONAL CAST IRON PIPE CO.

BIRMINGHAM, ALA.

WATER PIPE—
GAS PIPE

PROMPT SHIPMENTS

SALES OFFICES:

Write Nearest Office for Prices

HAMMOND-BYRD IRON CO., Peoples Gas Building, Chicago
NATIONAL CAST IRON PIPE CO., Commerce Trust Building, Kansas City, Mo.
BLAIR & COMPANY, Bankers Investment Building, San Francisco, Cal.

NATIONAL Pipe is made *Right*—on new equipment—by use of special cores.
NATIONAL Pipe has smoothest inside finish—easiest to work.

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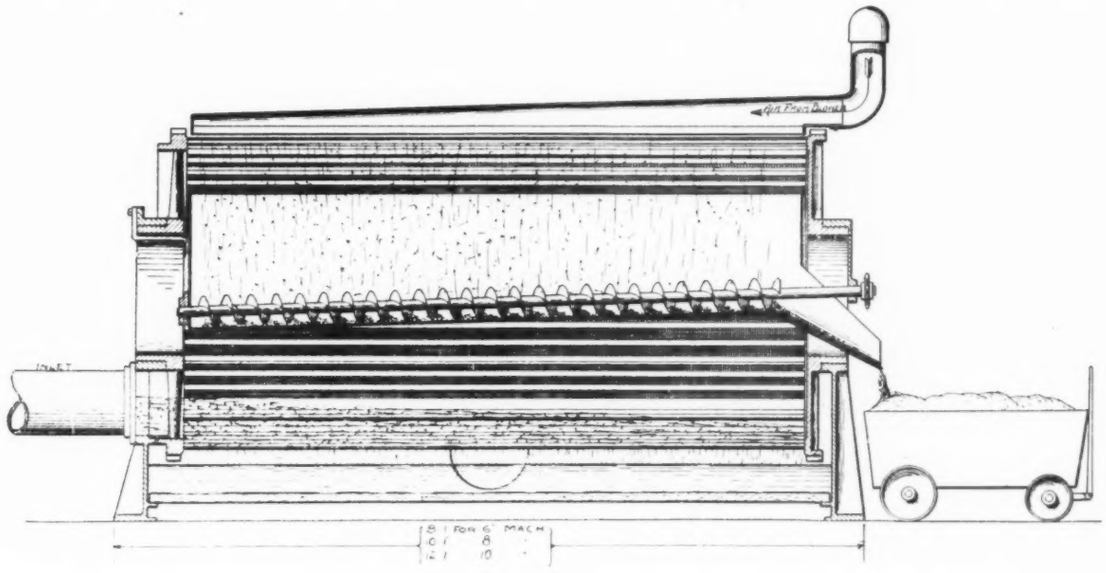
The North Sewage Screen



solves the sewage clarification problem

Fine screening (40 mesh or finer), with chlorination if necessary, is the ideal method of sewage clarification. The *North Sewage Screen* is designed and built to meet all requirements and its actual operation proves it.

Adapted to any System

Easy to install, machine being all in one piece, no special work being needed.

Made in proper sizes to fit capacity of individual sewers.

Takes sewage from end of sewer, no intercepting sewer being needed.

Costs Little to Maintain

Requires no extra pumping.

Needs only two horsepower, there being no blower to use up power.

No brushes to replace.

Simple to Operate

Automatic and fool proof, requiring no skilled labor.

Does not require constant attention from an operator.

Sanitary and Inoffensive

No odor caused during process.

Solids taken out whole, holding 65% moisture, and can be handled with a pitchfork.

Tests on fresh sewage show removal of 40% of suspended matter.

Screenings suitable for fertilizer.

Fluid screening machinery made in sizes from 500,000 to 10,000,000 gallons per 24 hours. *North* water screens increase sand filter capacity 100%.

Whatever your sewage disposal problem, write to

The Green Bay Foundry & Machine Works, Green Bay, Wis.

FREEZING WEATHER Is Here

The ARCTIC

—Then your water meters will be put to the test. Some of them are sure to be put to the test.

Install Arctics now and instead of paying the maximum repair bill, it will be the minimum.

Send for Bulletin No. 58

A few cents and several minutes' time, puts in place another breakable frost bottom—service is resumed and the cost of a new meter saved.

Pittsburgh Meter Company

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KANSAS CITY—6 W. 10th St.
COLUMBIA, S. C.—1433 Main St.
LOS ANGELES—Union Oil Bldg.
SEATTLE—802 Madison St.

METERS FOR MEASURING WATER, OIL, GASOLINE, NATURAL AND ARTIFICIAL GAS, AIR, OXYGEN AND ALL OTHER GASES AND LIQUIDS, EITHER HOT OR COLD, AT ANY PRESSURE